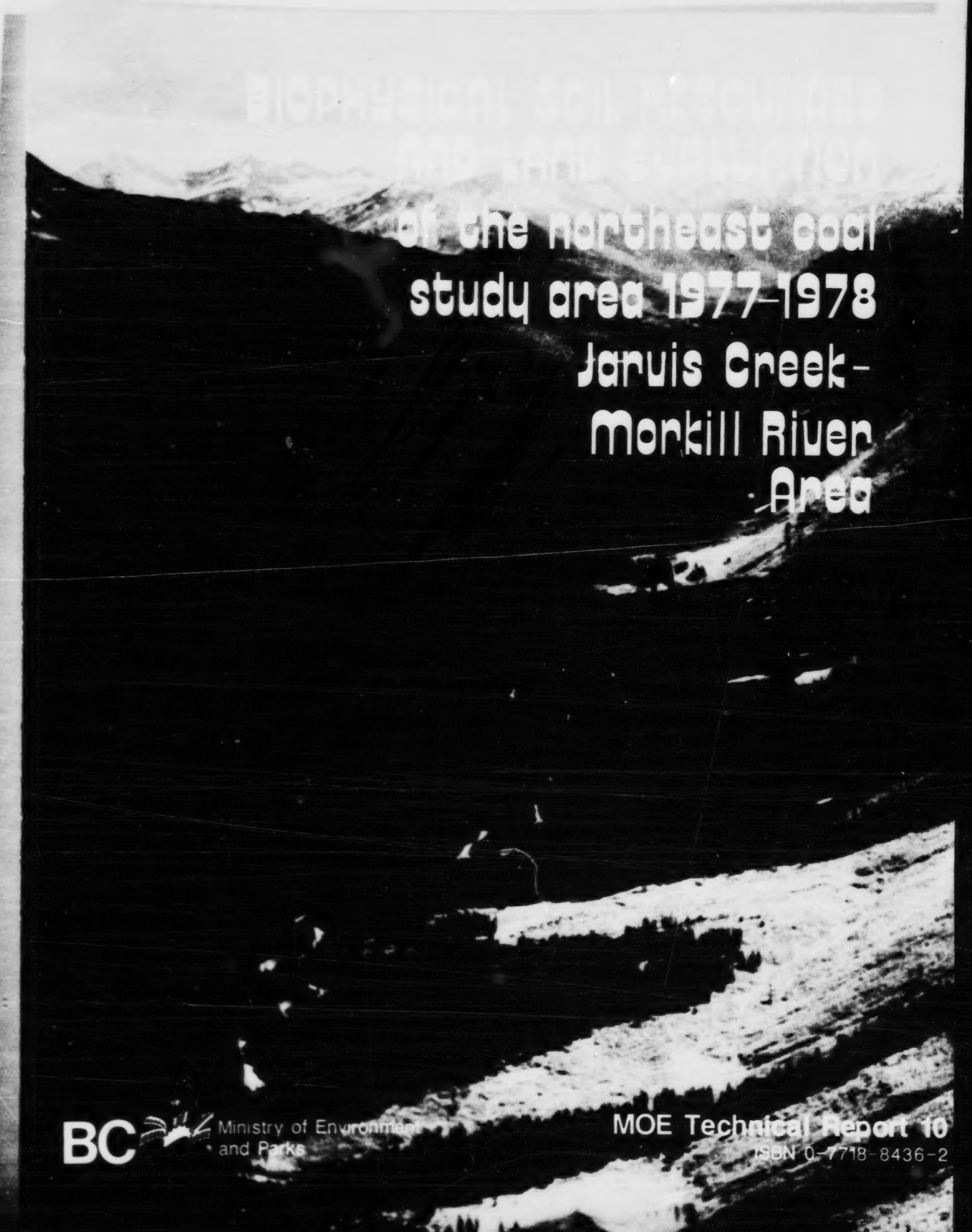

Biophysical Soil Resources and Land Evaluation of the northeast coal study area 1977-1978

Jarvis Creek - Morkill River Area

BC Ministry of Environment and Parks

MOE Technical Report 10
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COVER PHOTO: Looking up Cushing Creek. Extensive avalanche slopes with runout zones often extending across the valley floor, dramatically characterize this valley. A wide variety of soils occur here as a result of the active geological processes. Two small lakes, in the foreground, described as "plunge pits" are the result of concentrated snow avalanches.

BC

Ministry of
Environment and Parks

MOE Technical Report 10

BIOPHYSICAL SOIL RESOURCES AND LAND EVALUATION OF THE NORTHEAST COAL STUDY AREA, 1977-1978 JARVIS CREEK-MORKILL RIVER AREA

Report No. 41
British Columbia Soil Survey

Robert Maxwell, P. Ag.
SURVEYS AND RESOURCE MAPPING BRANCH

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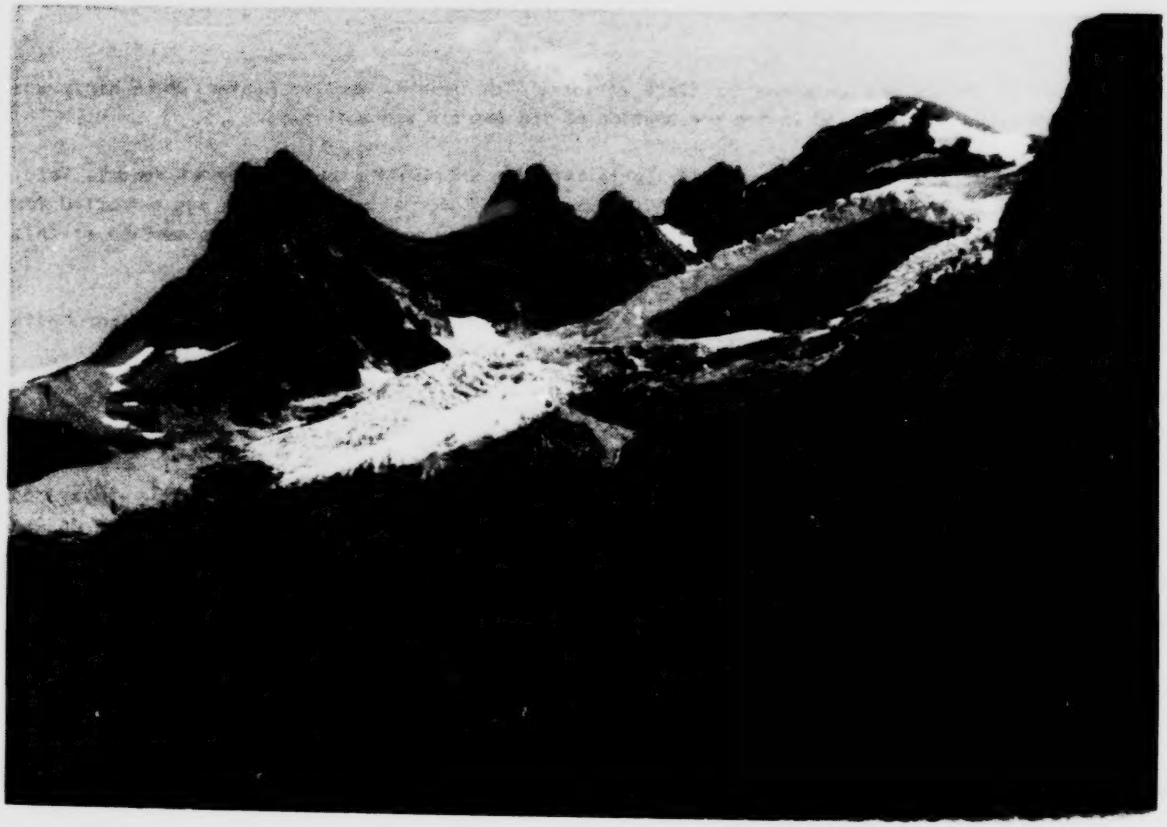

Frontispiece: Looking east towards Mount Ovington at the southern end of the Hart Ranges in the Rocky Mountains. Receeding glacial ice expose fresh deposits of calcareous moraine, here new soil surfaces begin the processes of weathering.
Soils along the mountain ridges are complex, rubbly frost heaved knolls lie adjacent to rich meadow sites with dark turfy surfaces. Soils of the upper forested slopes are podzolized, often being calcareous at depth. The area is subject to deep snow cover and cool summers.

ACKNOWLEDGEMENTS

Special thanks are extended to field personnel Tom Ovanin, Marilyn Hunter, Ruth Hardy and Purna Mahrajan, who assisted in the preparation of the terrain and soil maps.

Sincere appreciation is extended to Terje Vold for writing the earlier sequel report, Vold, T., R. Maxwell and R. Hardy (1977) from which much of the information and format was extracted for this report. Appreciation is extended to Greg Cheeseman for writing the climate section of this report.

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ABSTRACT

East of Prince George, British Columbia, 820 000 ha of mountainous soils were mapped and described at a reconnaisance level of information (1:50 000 scale) and generally provides the physical data necessary for forestry, engineering, recreation, wildlife and agricultural interpretations at the regional planning level. The surficial geology was mapped using the Terrain Classification System (ELUC Secretariat 1976) and provided the primary base for soil classification and soil mapping at the soil association or soil subgroup level using the 1973 (revised) Canadian System of Soil Classification. Fifty soil profiles were sampled and analysed according to McKeague, J. A., editor, (1978). These analyses provided the technical data necessary for most soil interpretations.

The project area encompassed parts of the Rocky Mountain Foothills, Rocky Mountains, Rocky Mountain Trench, McGregor Plateau and Cariboo Mountains. The parent materials of soils sampled and described were originally derived from sandstone, siltstone, limestone and quartzite; as well as materials derived from mixtures of sedimentary and metamorphic bedrock origins. Notable areas of environmental concern were identified, specifically, numerous large valleys floored with deep, extensively gullied and highly erodible lacustrine sediments.

Forest zones identified in the study area include the Interior western hemlock - western red cedar zone; Interior western red cedar - white spruce zone; Subboreal white spruce - alpine fir zone; Subalpine Engelmann spruce - alpine fir zone and the Alpine tundra zone[1].

---

[1] Biogeoclimatic zonation, as it relates to this biophysical classification can be found in Table 2.7.

PREFACE

This technical report has been prepared for the Northeast Coal Study. It is a technical supplement to the Northeast Coal Study Preliminary Environment Report, 1977 - 1978 and as such is a component of a broad environmental study to gather baseline data to assess environmental impacts of the northeast coal and associated developments. The study was requested by the provincial government's Environmental Land Use Sub-Committee on Northeast Coal Development.

This report presents the biophysical soil baseline information which includes terrain maps, soil maps, soil analyses, soil descriptions and interpretations for the engineering, forestry and recreational aspects of soils.

The data, analysis and interpretations that are contained within this technical report and map series will assist in the development and implementation of a rational resource management policy. In addition, the information presented here should provide a base for a more systematic understanding of the physical and biological components of land and water systems.

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CHAPTER ONE
INTRODUCTION

1.1 INTRODUCTION

Biophysical soil resources of the Northeast Coal Development Study Area were inventoried and mapped to provide basic data for environmental impact assessments and support data for other resource disciplines. The rationale for a soil resource inventory is threefold:

(i) Considerable financial savings can result if the most appropriate soils are used for land use developments. For instance, roads built on soils with few physical limitations cost less to construct than road build on soils with several limitations.

(ii) All renewable resources are dependent upon soil, which is a non-renewable resource. This fact necessitates soil conservation in order to provide sustained yields of agricultural crops, timber, and forage for wildlife.

(iii) Understanding of soil capability for various land uses is necessary in order to help answer problems associated with land resource allocation.

The terms "biophysical soil" and "soil" are used interchangeably since the soils described in this report were differentiated by integrating both physical and biological components of land.

The three main objectives of the biophysical soil resource and land evaluation program are:

(i) to describe and map the soils of the study area at a scale of 1:50 000;

(ii) to interpret the soils with respect to their suitability for various land uses including agriculture, forestry, wildlife, recreation and engineering;

(iii) to provide basic data for environmental impact assessment of development proposals, including various railway, highway, pipeline, and townsite locations.

The report is written for land use planners and resource managers. The report and appendices include detailed soil descriptions and interpretations for resource managers. The appendices are especially intended for readers interested making interpretations based on the 1:50 000 scale soils maps. These maps are available upon request by contacting MAPS-B.C., Parliament Buildings, Victoria, British Columbia, V8V 1X5; a microfiche of each map is presented in the rear pocket of this volume.

The biophysical soils program, began in May, 1976; it was part of a broad environmental inventory and assessment study initiated by the Environment and Land Use Sub-Committee on Northeast Coal Development. The objective of that biophysical soil program was met in submissions to the Sub-Committee's environmental report (E.L.U.S.C., 1977). Other programs in the study area include climate, terrain, vegetation, aquatic, wildlife, recreation, visual, and heritage resources. As with the other resource programs, the study of the soil resources continued through 1977-78 for the Northeast Coal "extension area". This volume is the final soil report of the "extension area". It constitutes a technical supplement to the Northeast Coal Study Preliminary Environmental Report 1977-1978.

1.2 LOCATION

The map area is located in east central British Columbia (Figure 1.1). It is bounded on the east by the British Columbia - Alberta boundary, longitude 120°, on the west by longitude 121°, on the south by latitude 53° 30', and on the north by latitude 54° 30. The area includes N. T. S. mapsheets 93I/1, 2, 7, 8, and 93H/9, 10, 14, 15 and 16. The major settlements in the vicinity of the study area are Prince George, 90 km to the west, Dawson Creek, 145 km to the north; and McBride, 40 km to the south.

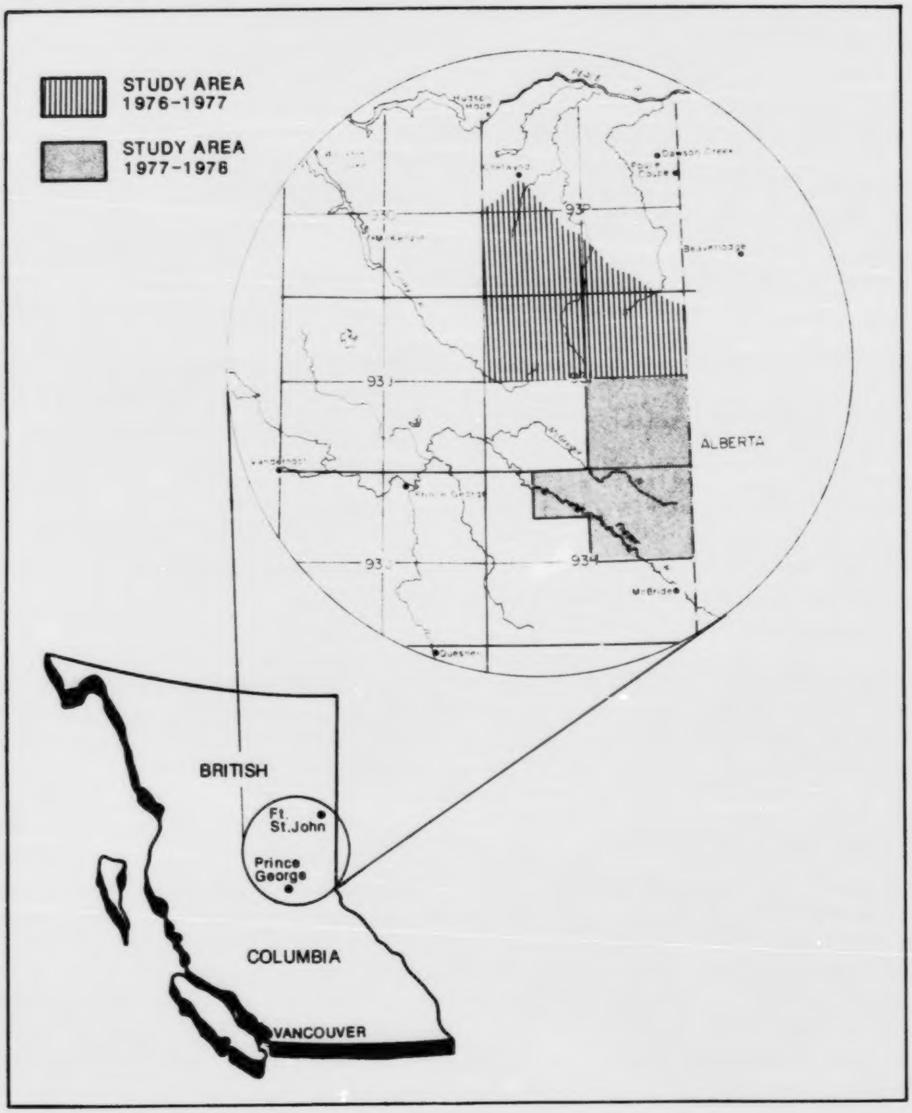
STUDY AREA 1976-1977
STUDY AREA 1977-1978
Hudson Hope
Chetwynd
Dawson Creek
Pouce Coupe
93O
93P
Beaverlodge
93J
93I
ALBERTA
Vanderhoof
Prince George
93G
93H
McBride
Quesnel
BRITISH
Ft. St.John
Prince George
COLUMBIA
VANCOUVER

Figure 1.1 Location of Study Area.

1.3 HOW TO USE THE SOIL MAPS AND REPORT

The descriptions of the soils and the environments in which they occur and their capability or suitability (or limitations) for specific uses is presented in the report. The soils described in the report are related to the soil map through the soil map legend. The soil maps, which indicate the location and extent of the various soils, are available through MAPS-B.C., Parliament Buildings, Victoria, British Columbia, V8V 1X5. They should be used in combination with the report at all times.

The soil maps indicate the extent and distribution of the various kinds of soil and identify them by means of symbols. The map legend describes the symbols used to identify the different soils found on the map; the soils are described further in the report.

The mapping is of a reconnaissance nature and is intended to be used for overview planning purposes and for general management decisions. Detailed application will require further on-site inspection to confirm the exact nature of the soil at a particular site. The definitions of the soil association components are subjective and will facilitate more detailed investigations.

General information about the map area is contained in the next chapter. For more soil information the reader is referred to the chapter entitled "Description of the Soil Associations, Their Environment, and Comments on Land Use". Information on the suitability (or limitations) of the soils for specific uses is presented in Appendix C, D and E.

Detailed soil profile descriptions and laboratory data are not included in this report but are available, on request, from the British Columbia Soil Information System, Ministry of Environment, Parliament Buildings, Victoria, British Columbia, V8V 1X4.

Vegetation information which correlates with the soil association component level in this report will be contained in a technical report "Vegetation Resources of the Northeast Coal Study Area 1977 - 1978", currently in preparation.

CHAPTER TWO
A GENERAL DESCRIPTION OF THE JARVIS CREEK - MORKILL RIVER MAP AREA

2.1 REGIONAL CLIMATE[1]

The climate of the Study Area is greatly influenced by the Rocky Mountains. Moist, coastal air masses travel predominantly from the west, rise as they approach this natural barrier, and by condensation, are forced to release considerable quantities of moisture as rain and snow on the western slopes of the mountains. In consequence, the descending air crossing the eastern flanks of the mountains is drier and warmer. During the winter months, the Study Area is frequently subjected to Arctic air from the northeast. The Rocky Mountains act as a barrier, often preventing the westward movement of this cold stable air. The combined effect of these climatic influences is a tendency for lower annual precipitation and lower annual temperatures on the eastern side of the Continental Divide than on the western side.

During the following discussion, comparisons are made between climatic conditions in the Study Area and conditions both at Dawson Creek and McBride. For both Dawson Creek and McBride, relatively long-term climatic data are available (Tables 2.2 and 2.3). Shorter term climatic stations operated in or near the Study Area from 1976 to 1980 have been normalized to the 1951 to 1980 period. Table 2.1 gives station location information for which climatic data are presented in the following text.

Temperature

Tables 2.2, 2.3 and 2.4 provide temperature data characterizing the Study Area. It can be seen that stations in the Fraser River Valley have the warmest values with temperatures decreasing with increasing elevation in the mountains. Stations on the eastern side of the Rockies tend to have cooler mean annual temperatures than those on the west mainly due to colder winters. At the same elevation, summer temperatures are generally similar.

Growing degree days and freeze-free periods are shown in Table 2.6. Growing degree days follow the same pattern as mean temperatures. Freeze-free periods tend to vary, however, in general, the longest periods are still to be found in the Fraser River Valley.

Precipitation

Tables 2.2, 2.3 and 2.5 show total monthly precipitation values for the Study Area. These values reflect the expected pattern of increasing precipitation with increasing elevation on the western side of the Rockies and decreasing to the lowest values, found on the eastern side as shown by Dawson Creek.

Snow fall varies from 37% of total precipitation at Dawson Creek to 54% at McBride. It can be expected that snowfall will be in excess of 50% of total precipitation at the higher elevation stations.

---

[1] Climate information is provided by G. Cheesmen, Waste Management Branch, Ministry of Environment, Victoria, B.C.

Table 2.1
Climatological Station Location Information

	Latitude	Longitude	Elevation (m)
Mountains south of Fraser Valley			
Dome L/O	53 40	121 05	1451
Dome Mountain	53 37	121 01	1945
Fraser Valley			
McBride N. AES	53 22	120 15	771
McBride 4SE AES	53 16	120 09	722
McBride (lower) - snow survey	53 20	120 17	790
Cresent Spur	53 34	120 41	660
Driscoll	53 50	121 17	673
Hansard No. 1 - snow survey	54 05	121 52	590
In Rockies			
McCullagh	54 03	121 05	776
Hedrick Lake	54 06	121 00	1134
Knudsen Lake	54 18	120 47	1694
Revolution 2	53 47	120 22	1692
East Side of Rockies			
Dawson Creek Airport	55 46	120 13	663
Kinuseo Falls	54 46	121 14	886
Stoney Lake	54 50	120 36	1085
Quintette 2	54 52	120 59	1541

Table 2.2[1]
Temperature and Precipitation Normals for Dawson Creek

DAWSON CREEK A 55° 44'N 120° 11'W 655 m	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR	CODE
Daily Maximum Temperature (°C)	-12.4	-5.9	-1.3	8.8	16.2	19.5	21.7	20.6	15.5	9.8	-0.9	-8.0	7.0	8
Daily Minimum Temperature (°C)	-23.9	-17.9	-12.7	-3.5	2.1	6.6	8.5	7.2	3.3	-1.3	-10.9	-18.7	-5.1	8
Daily Temperature (°C)	**-18.2**	**-11.9**	**-7.0**	**2.7**	**9.1**	**13.1**	**15.1**	**13.9**	**9.4**	**4.2**	**-5.9**	**-13.4**	**0.9**	**8**
Standard Deviation, Daily Temperature	6.2	6.9	3.1	2.2	1.1	1.0	1.0	1.2	1.7	1.5	4.9	5.1	1.1	5
Extreme Maximum Temperature (°C)	10.0	11.1	14.5	29.0	30.6	33.3	32.2	32.2	28.9	27.0	18.9	11.5	33.3	
Years of Record	12	12	13	13	13	13	13	13	13	12	12	13		
Extreme Minimum Temperature (°C)	-48.3	-45.0	-44.4	-23.3	-8.3	-5.0	0.0	-3.9	-16.7	-20.0	-38.9	-44.0	-48.3	
Years of Record	12	12	13	13	13	13	13	13	13	12	12	13		
Rainfall (mm)	0.9	0.2	1.3	4.4	28.5	73.1	70.8	65.7	36.9	12.4	3.1	0.1	297.4	8
Snowfall (cm)	34.6	25.6	26.0	15.1	4.0	0.0	0.0	1.9	3.4	16.9	24.4	36.0	187.9	8
Total Precipitation (mm)	**36.1**	**28.9**	**30.6**	**19.0**	**35.2**	**72.8**	**70.8**	**68.9**	**41.5**	**30.9**	**29.6**	**39.4**	**503.7**	**8**
Standard Deviation, Total Precipitation	18.9	24.8	14.5	9.1	30.9	45.0	43.6	35.2	32.4	10.5	15.7	30.3	88.0	5
Greatest Rainfall in 24 hours (mm)	2.5	0.8	5.8	5.3	41.4	66.5	63.0	57.4	26.2	18.6	13.0	1.0	66.5	
Years of Record	12	12	13	13	13	13	13	13	13	12	13	13		
Greatest Snowfall in 24 hours (cm)	19.6	12.6	12.2	17.4	4.3	0.5	0.0	35.3	22.1	17.0	13.7	26.0	35.3	
Years of Record	12	12	13	13	13	13	13	13	13	12	13	13		
Greatest Precipitation in 24 hours (mm)	19.6	12.6	12.2	17.4	42.4	66.5	63.0	57.4	26.2	22.1	13.7	26.0	66.5	
Years of Record	12	12	13	13	13	13	13	13	13	12	13	13		
Days with Rain	0	1	1	3	9	13	13	13	11	5	2	0	70	8
Days with Snow	14	12	12	5	1	0	0	0	1	4	10	12	71	8
Days with Precipitation	15	12	13	7	9	13	13	13	12	9	12	12	140	8

[1] From Atmospheric Environment, 1982a.

Table 2.3[1]
Temperature and Precipitation Normals for McBride

McBRIDE 4SE 53° 16'N 120° 9'W 722 m	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR	CODE
Daily Maximum Temperature (°C)	-5.9	-0.3	4.3	12.0	18.1	21.0	23.8	22.5	17.2	10.2	1.2	-3.3	10.1	3
Daily Minimum Temperature (°C)	-14.7	-9.3	-5.9	-1.5	2.4	6.2	7.7	6.9	4.2	0.4	-5.8	-10.4	-1.7	8
Daily Temperature (°C)	**-10.3**	**-4.8**	**-0.8**	**5.3**	**10.3**	**13.7**	**15.8**	**14.7**	**10.7**	**5.3**	**-2.3**	**-6.9**	**4.2**	**8**
Standard Deviation, Daily Temperature	3.5	3.0	2.3	1.8	1.2	1.3	1.0	.14	1.0	1.5	3.4	3.9	0.8	3
Extreme Maximum Temperature (°C)	11.7	13.3	20.0	28.9	32.8	35.0	37.8	35.6	33.3	26.7	13.9	14.4	37.8	
Years of Record	49	51	47	50	50	51	50	50	48	49	49	51		
Extreme Minimum Temperature (°C)	-46.7	-42.8	-37.8	-24.4	-9.4	-6.1	-3.9	-3.9	-10.6	-20.6	-37.8	-45.6	-46.7	
Years of Record	49	50	47	50	50	51	50	50	47	49	49	50		
Rainfall (mm)	11.2	9.3	13.5	22.6	34.6	52.9	50.7	53.4	58.8	57.9	29.4	12.4	406.7	3
Snowfall (cm)	58.7	35.3	32.4	11.8	0.7	0.0	0.0	0.0	0.2	3.3	26.7	49.7	218.8	3
Total Precipitation (mm)	**69.9**	**44.6**	**45.9**	**34.4**	**35.2**	**52.9**	**50.7**	**53.4**	**59.0**	**61.4**	**56.1**	**62.0**	**625.5**	**3**
Standard Deviation, Total Precipitation	53.4	27.7	42.4	17.9	17.9	21.3	26.9	30.0	27.0	28.0	23.3	35.2	110.6	3
Greatest Rainfall in 24 hours (mm)	50.0	22.4	20.8	17.3	21.8	42.9	31.8	42.9	40.1	32.8	24.1	45.2	50.0	
Years of Record	50	51	47	50	50	51	50	50	50	49	49	50		
Greatest Snowfall in 24 hours (cm)	45.7	42.7	27.9	13.3	10.2	0.0	0.0	0.0	2.5	12.7	48.3	56.4	56.4	
Years of Record	50	50	47	50	50	51	50	50	50	49	49	49		
Greatest Precipitation in 24 hours (mm)	50.0	42.7	27.9	19.8	21.8	42.9	31.8	42.9	40.1	32.8	48.3	56.4	56.4	
Years of Record	50	50	47	50	50	51	50	50	50	49	49	48		
Days with Rain	2	2	4	6	10	12	11	12	13	12	6	2	92	3
Days with Snow	10	8	7	3		0	0	0		1	6	10	45	3
Days with Precipitation	11	9	10	9	10	12	11	12	13	13	11	12	132	3

[1] From Atmospheric Environment, 1982a.

Table 2.4
Mean Monthly Temperatures (°C)

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Dome L/O	-9.3	-4.9	-1.7	2.7	6.7	9.4	11.3	10.5	7.0	3.1	-2.6	-6.3	2.1
Dome Moutlan	-11.2	-7.6	-4.9	-1.1	2.2	4.6	6.2	5.6	2.6	-0.6	-5.5	-8.7	-1.5
McBride N. AES	-9.0	-3.9	-0.3	5.1	9.7	12.8	14.8	13.9	9.8	5.1	-1.7	-5.9	4.2
Cresent Spur	-10.3	-4.7	-0.6	5.0	9.7	13.0	15.1	14.1	10.1	5.3	-1.7	-6.4	4.0
Driscoll	-10.5	-5.1	-1.1	4.2	8.9	12.1	14.2	13.2	9.2	4.6	-2.2	6.8	3.3
McCullagh	-12.5	-6.8	-2.7	3.1	8.0	11.4	13.6	12.6	8.3	3.5	-3.7	-8.5	2.1
Hedrick Lake	-12.5	-7.3	-3.5	1.8	6.4	9.6	11.6	10.7	6.7	2.2	-4.5	8.9	1.0
Knudsen Lake	-11.7	-7.5	-4.4	0.2	4.1	6.9	8.8	8.0	4.6	0.6	-5.2	-8.8	-0.3
Revolution 2	-11.7	-7.4	-4.2	0.2	4.2	7.0	8.9	8.1	4.6	0.7	-5.0	-8.7	-0.2
Kinuseo Falls	-14.2	-9.3	-5.7	1.8	7.7	10.9	12.7	11.8	7.8	3.3	-4.8	-10.5	0.9
Stoney Lake	-14.2	-9.5	-6.0	1.3	6.9	10.0	11.8	10.9	7.0	2.7	-5.1	-10.6	0.4
Quintette 2	-14.8	-10.3	-7.1	-0.3	4.7	7.5	9.2	8.3	4.8	1.0	-6.2	-11.3	-1.2

Table 2.5
Total Monthly Precipitation (mm)

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Dome L/O					87	125	96	118	113				
Dome Mountain					76	110	84	104	117				
McBride N. AES	69	38	52	37	40	63	58	55	71	64	60	59	666
Crescent Spur					74	106	82	101	114	69			
Driscoll					76	110	84	104	117	94			
McCullagh	131	101	79	49	71	102	78	97	109	122	117	131	1186
Hedrick Lake	215	165	129	81	106	153	117	145	163	200	191	215	1879
Knudsen Lake	134	103	80	50	91	130	100	123	139	124	119	134	1326
Revolution 2	149	115	89	56	81	116	89	110	123	138	133	149	1346
Kinuseo Falls	88	68	53	33	57	82	63	78	88	82	79	88	861
Stoney Lake	40	30	38	24	60	92	101	80	64	25	38	41	632
Quintette 2	127	98	120	76	77	117	128	101	81	80	121	133	1259

Climatic moisture deficits in the Study Area generally would not seem to be a problem. There is a deficit of approximately 125 mm in the McBride area, however, this decreases to a surplus northward in the Trench and with increasing elevation. Surpluses in excess of 400 mm at higher elevations can be expected. On the eastern side of the Rockies, in the foothills, deficits near 100 mm may occur depending on topography.

Snowdepths and Avalanches

Average maximum snowdepths will vary from approximately 50 cm at McBride to 100 cm near McGregor and up to about 250 cm at higher elevations. On the eastern side of the Rockies snowdepths range from 50 to 175 cm depending on elevation. Table 2.6 shows snowdepths, both the average maximum and the maximum observed, for various stations in and near the Study Area.

Avalanche zones pose moderate to severe technical problems along all of the possible transport corridors which make use of high mountain passes to traverse the Rocky Mountains. Corridors which are confined to the east side of the Divide exhibit a low to moderate avalanche hazard only.

Further information on both average maximum snowdepths and avalanche potential are available in map form from Air Studies Section, Ministry of Environment, Parliament Buildings, Victoria, British Columbia. V8V 1X5.

Table 2.6
Growing Degree Days (>5°C), Freeze-free Period (da) and Snow Depths (cm)

Station	Growing Degree Days[2]	Freeze-free Period[2]	Average Maximum Snowdepth[2]	Maximum Observed Snowdepth	Period of Snow Observation Record (years)
Dome L/O	647	57	N/A	-	-
Dome Mountain	73	32	218	284	13
McBride 4SE AES	1292	79[3]	N/A	-	-
McBride N AES	1176	59	N/A	-	-
McBride lower-snow survey[1]	N/A	N/A	49	91	9
Crescent Spur	1219	71	N/A	-	-
Driscoll	1064	61	N/A	-	-
Hansard #1 - snow survey[1]	N/A	N/A	95	148	30
McCullagh	930	52	149	168	4
Hedrick Lake[1]	657	40	193	295	17
Knudsen Lake[1]	307	39	237	351	15
Revolution 2[1]	314	36	224	300	13
Dawson Creek Airport	1127	78[3]	N/A	-	-
Kinuseo Falls	851	59	57	85	4
Stoney Lake	720	48	57	90	4
Quintette 2	384	40	180	217	4

[1] Snowdepths from Inventory and Engineering, 1980.

[2] Values if not long-term have been adjusted by Air Studies to reflect long-term.

[3] Values from Atmosphere Environment, 1982b.

2.2 PHYSIOGRAPHIC REGIONS

The Study Area consists of six physiographic regions[1] - the Alberta Plateau Benchlands, the Rocky Mountain Foothills, the Rocky Mountains, the McGregor Plateau (which is part of the Interior Plateau), the Rocky Mountain Trench, and the Cariboo Mountains. Their location is shown in Figure 2.1.

The Alberta Plateau Benchlands

The Alberta Plateau Benchlands form an area of rolling uplands which are underlain by carbonaceous sandstones, shales and minor amounts of conglomerate. The elevation of the region ranges from 760 to 1,220 metres above sea level. The region is restricted to only the northeastern portion of the Study Area. To the northeast (outside this Study Area) it includes much of the proposed corridor from Saxon Ridge northwards to Tumbler Ridge.

The Rocky Mountain Foothills

The Rocky Mountain Foothills are characterized by a series of subparallel ridges and valleys which are situated between the Rocky Mountains on the west and the plateau benchlands to the east, and are dissected by major northeasterly-flowing rivers. These rivers and some of their tributaries are entrenched in very deep canyons. The Foothills, underlain by complex associations of faulted and folded shales and sandstones, have a general elevation between 1,220 and 1,800 metres above sea level. The Foothills include the coal-bearing areas, the three proposed townsites near Saxon Ridge, and the western segment of the proposed corridor from Saxon Ridge northwards to Tumbler Ridge.

The Rocky Mountains

The Rocky Mountains, underlain by faulted and folded sedimentary rocks, consist of a series of roughly parallel ridges and valleys which are aligned predominantly in a northwest to southeast direction. Limestones, dolomites and quartzites tend to compose in the mountain massifs, while the major valleys are principally underlain by shales and sandstones. Elevations range from approximately 920 to more than 3,000 metres above sea level. All of the proposed corridors between Saxon Ridge and the Fraser River Valley traverse high passes through the Rocky Mountains.

The McGregor Plateau

The McGregor Plateau forms the eastern component of the Interior Plateau and, in the Study Area, consists of a series of parallel ridges aligned in a northwest to southeast direction and are underlain by sedimentary rocks. Elevations here range from 760 to more than 1,900 metres above sea level. Within the Study Area, the McGregor Plateau forms the belt of country between the Fraser River and the Rocky Mountains.

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[1] Adapted from: Holland, S. H. 1964. Landforms of British Columbia: A Physiographic Outline. British Columbia Department of Mines and Petroleum Resources, Bulletin No. 48. Victoria, British Columbia. 138 pp.

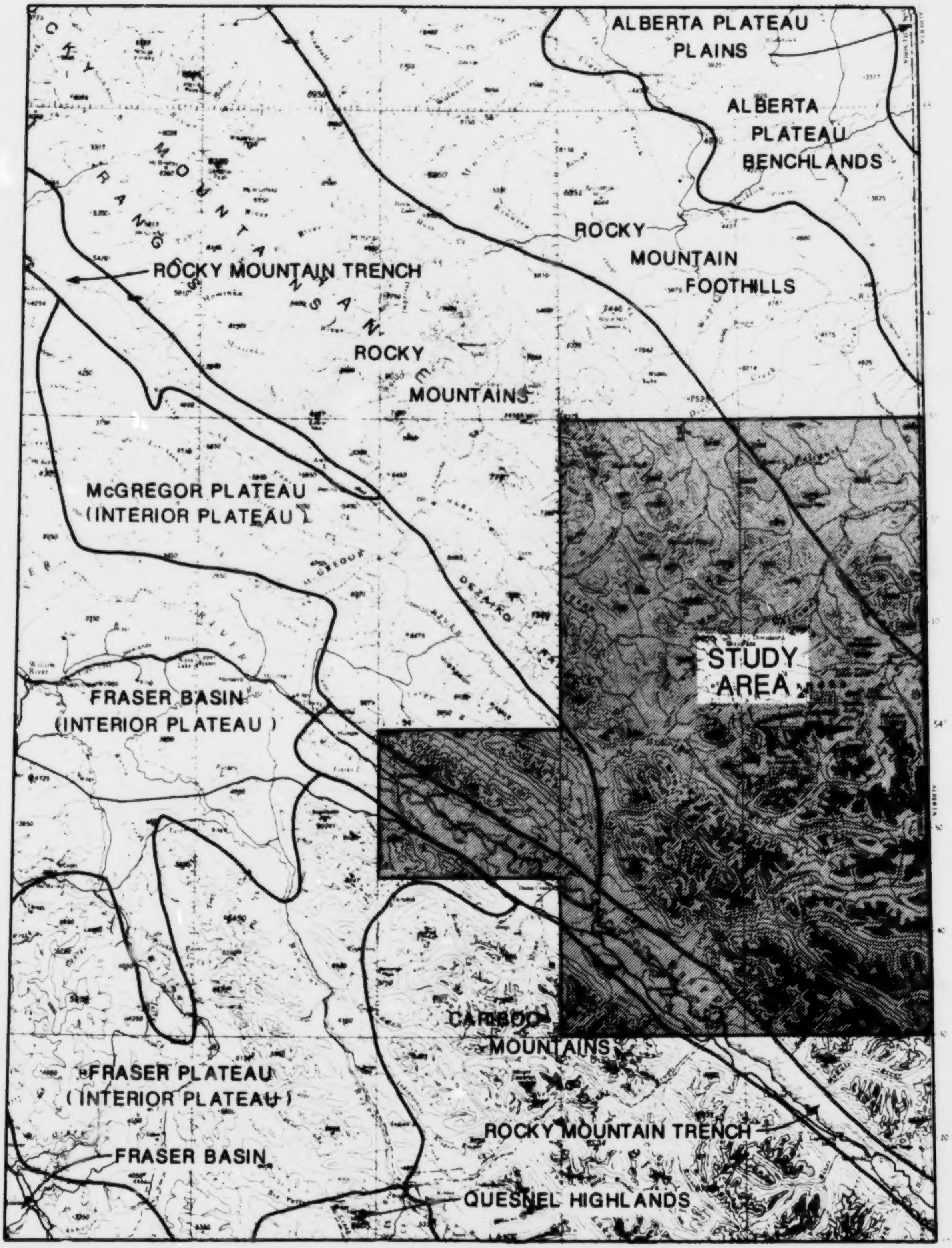

ALBERTA PLATEAU PLAINS
ALBERTA PLATEAU BENCHLANDS
ROCKY MOUNTAIN FOOTHILLS
CARIBOO RANGE
ROCKY MOUNTAINS
ROCKY MOUNTAIN TRENCH
McGREGOR PLATEAU (INTERIOR PLATEAU)
FRASER BASIN (INTERIOR PLATEAU)
STUDY AREA
CARIBOO MOUNTAINS
FRASER PLATEAU (INTERIOR PLATEAU)
ROCKY MOUNTAIN TRENCH
FRASER BASIN
QUESNEL HIGHLANDS

Figure 2.1 Physiographic Regions from Northeast Coal Report 1977-78.

The Rocky Mountain Trench

The Rocky Mountain Trench occurs in the southwestern portion of the Study Area along sections of the Fraser and McGregor River valleys. It is an erosional feature which has developed over a major bedrock structure now largely filled with unconsolidated sediments. The elevation of this region is approximately 760 metres above sea level.

The Cariboo Mountains

The Cariboo Mountains are located in the extreme southwest portion of the Study Area. The mountains are aligned predominantly northwestward parallel to the strike of the underlying sedimentary rocks; the individual mountains and ranges are composed of sedimentary and metamorphosed sedimentary rock. Elevations range from 1,200 to more than 3,300 metres above sea level. Only a very minor portion of the Study Area occurs in the Cariboo Mountains.

2.3 BEDROCK GEOLOGY

The bedrock of each physiographic region has been grouped for soil mapping purposes; this helps to identify soil parent materials with unique physical and chemical characteristics which in turn are important to soil interpretations and soil classification (Figure 2.2). The groupings are most significant for soils derived from either basic or acidic colluvial parent materials.

The Rocky Mountain Foothills region consists primarily of Mesozoic sedimentary rock. The Foothills group reflects bedrock which has fine to medium grain sizes and ranges from weakly calcareous to very acidic in reaction. The lithology of this region includes fine grained sandstone, carbonaceous sandstone, siltstone, mudstone, shale and minor conglomerate and coal.

The Rocky Mountain region consists of two mountain ranges: the Hart Range, which occurs in the northeastern portion of the study area, and the Park Range, which includes the area south of the McGregor River. The Hart Range consists primarily of limestone and dolomite separated by a significant belt of quartzite which lies generally abreast of the Continental Divide. The limestone dominated portions have been grouped due to the dominating influence of the calcareous limestone and dolomite. The lithology of these portions includes limestone and dolomite with interbedded inclusions of shale and siltstone. The central quartzite belt is categorized separately due to the coarse grain size and acidic reaction. The lithology of this group includes quartzite, quartz-pebble conglomerate, shale, dolomite and limestone.

The Park Range consists of a formation geologically known as the Forgetmenot zone; this zone identifies the structural geology of the area. This zone has been grouped due to the dominance of fine grained rock with inclusions of medium and coarse grained rock. Although most of the bedrock in this area is non-calcareous the influence of the calcareous inclusions are reflected in most soil parent materials. The lithology of this group includes sandstone, shale, pebble conglomerate, slate, argillite, phyllite, schist and minor siltstone, limestone, quartzite and marble. For soil mapping purposes portions of the east flank of the Cariboo Mountains are also included in this group.

The bedrock of the McGregor Plateau has been grouped to reflect the fine to coarse grained rock and the dominating influence of carbonates on the soil parent materials. The lithology of

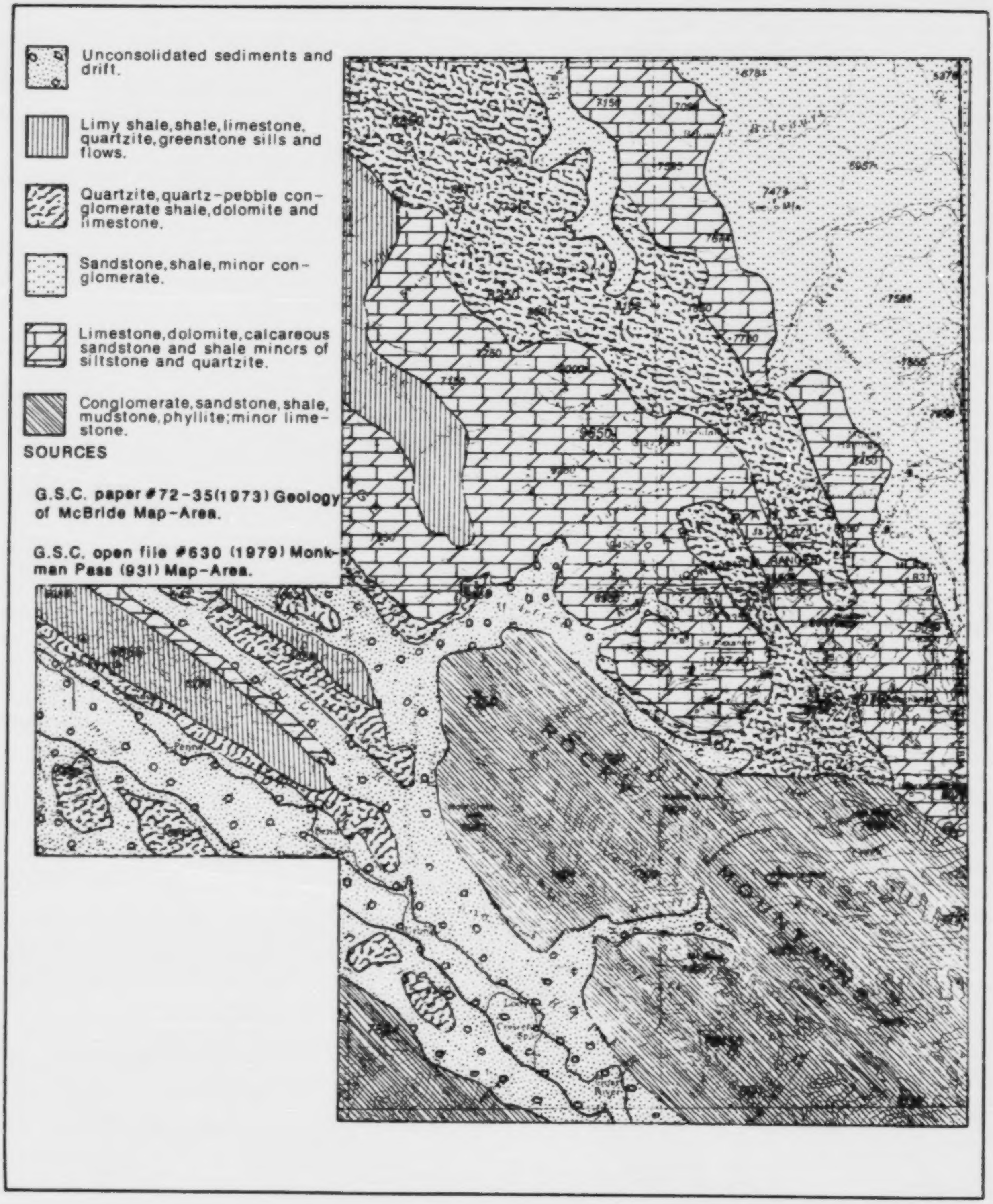
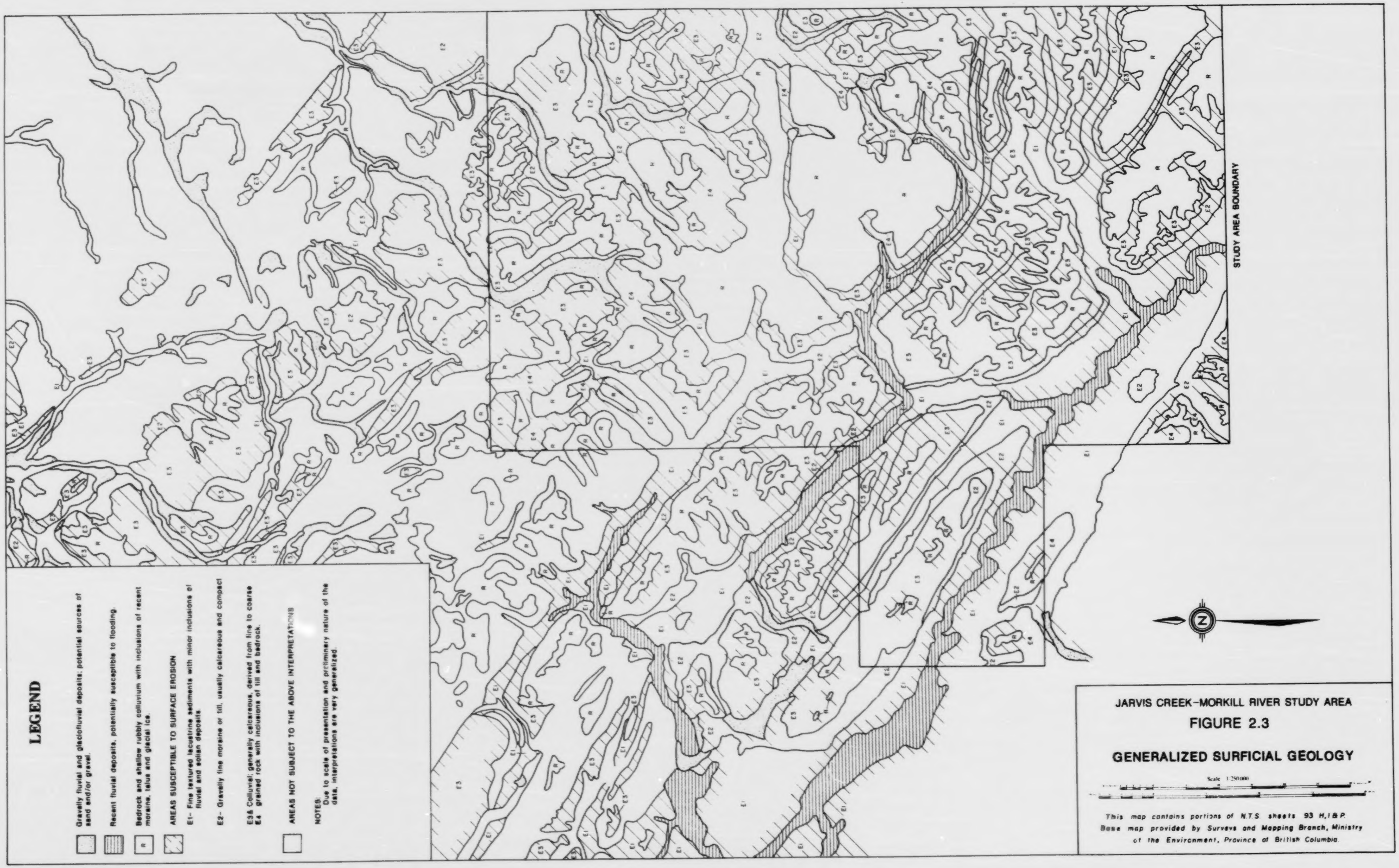

Unconsolidated sediments and drift.
Limy shale, shale, limestone, quartzite, greenstone sills and flows.
Quartzite, quartz-pebble conglomerate shale, dolomite and limestone.
Sandstone, shale, minor conglomerate.
Limestone, dolomite, calcareous sandstone and shale minors of siltstone and quartzite.
Conglomerate, sandstone, shale, mudstone, phyllite; minor limestone.
SOURCES
G.S.C. paper #72-35(1973) Geology of McBride Map-Area.
G.S.C. open file #630 (1979) Monkman Pass (93I) Map-Area.
ROCKY
MOUNTAINS

Figure 2.2 Generalized bedrock geology.



LEGEND

▨ Gravelly fluvial and glaciofluvial deposits; potential sources of sand and/or gravel.

▥ Recent fluvial deposits, potentially susceptible to flooding.

R Bedrock and shallow rubbly colluvium with inclusions of recent moraine, talus and glacial ice.

▨ AREAS SUSCEPTIBLE TO SURFACE EROSION

E1– Fine textured lacustrine sediments with minor inclusions of fluvial and eolian deposits.

E2– Gravelly fine moraine or till, usually calcareous and compact

E3& Colluvial; generally calcareous, derived from fine to coarse
E4 grained rock with inclusions of till and bedrock.

☐ AREAS NOT SUBJECT TO THE ABOVE INTERPRETATIONS

NOTES:
Due to scale of presentation and preliminary nature of the data, interpretations are very generalized.

JARVIS CREEK–MORKILL RIVER STUDY AREA

FIGURE 2.3

GENERALIZED SURFICIAL GEOLOGY

This map contains portions of N.T.S. sheets 93 H, I & P.
Base map provided by Surveys and Mapping Branch, Ministry of the Environment, Province of British Columbia.

this group includes limy shale, shale, limestone, dolostone, white quartzite and greenstone sills and flows.

2.4 RECENT GEOLOGICAL HISTORY[1]

The Study Area was glaciated on numerous occasions during the last few million years (the geological time period known as the Pleistocene Epoch). However, only deposits attributable to the most recent glaciation (the Fraser or Late Wisconsin Glaciation, which terminated approximately 10,000 to 12,000 years ago), are present over most of the region (Figure 2.5). At its maximum extent, the Fraser Ice-sheet covered all but the higher ridges and peaks of the region. The ice-sheet deposited moraine along the sides and bottoms of many valleys. This unsorted glacial material is normally stable unless it occurs on steep slopes where it may be affected by gullying and/or sliding. Figure 2.3 depicts a generalized distribution of the surficial materials

Approximately 12,000 years ago, a very marked climatic warming occurred which raised snow-lines above even their present positions. As the surface of the ice-sheet melted, the higher, buried peaks and valleys began to emerge first. With continued thinning of the ice, progressively more of the terrain emerged, until ice occured only in the valley bottoms and lowlands, especially to the west of the Continental Divide, where the Rocky Mountain Trench and the Interior Plateau were the last areas to become ice-free.

As a result of this mode of ice melting, water became trapped by ice dams as it attempted to escape to lower elevations. Ice-dammed lakes formed in many basins in the uplands, often in the upper reaches of valleys, and even in the cirques at the headward extremities of some valleys. Progressively larger lakes formed at successively lower elevations as ice fronts retreated and more areas became ice-free. Great thicknesses of lacustrine (or lake) clays, silts, and sands, and lesser amounts of lacustrine gravels, were deposited in the lake waters. The distribution of lacustrine sediments is also shown on Figure 2.3. Since most of the water which was produced by the melting of glaciers to the east of the Continental Divide was able to escape towards the Prairies, only a few small ice-dammed lakes formed in this part of the Study Area. The lake sediments are highly erodible, are characterized by gullying, failures and piping, and may have perched water tables where relatively impermeable fine textured soil horizons occur.

Gravels were deposited in situations where flowing water was either trapped and channelled along the margins of the ice-sheet, or was flowing away from the edges of the ice-sheet. Some of these ice-contact and glacial outwash deposits may serve as useful sources of aggregate. The outwash deposits frequently occur as river terraces.

Once the land was re-exposed to direct atmospheric processes, modification of the glaciated topography was initiated through the combined agencies of surface weathering and erosion. In valley bottoms, streams carved deep trenches in the lacustrine materials or became deeply incised in bedrock canyons. Where river valleys are broad, periodic flooding occurs, and the high water tables have promoted the widespread formation of peat bogs and swamps. On adjacent valley sides, mass-wasting and avalanching processes have produced a variable thickness of colluvium which either mantles slopes or has formed aprons and fans at the bases of slopes. Where the colluvium has been derived from a fine-grained source such as shale, it is often fine-textured, susceptible to erosion, and characterized by gullying and/or failure.

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[1] E.L.U.C. Secretariat, 1978. (p. 27-34).

Perhaps the most active landscape modification is currently occurring in the alpine and subalpine zones at present. Here the rates of snow avalanching and frost-related processes are, and have been, so rapid that materials on the land surface are continually migrating downslope. Even the most resistant types of bedrock, such as quartzite, do not escape modification. As a consequence, colluvium is the most commonly occurring material at the surface in the alpine and subalpine zones.

2.5 VEGETATION - FOREST ZONATION[1]

Three major forest regions are present in the Study Area - the Subboreal, Interior Wet Belt and Boreal Forest Regions. These regions, as defined, broadly reflect various macro-climatic influences on the vegetation of the Study Area. A comparison of the two vegetation classification systems, the "Biophysical Forest Zonation" (used in this report) and the "Biogeoclimatic Zonation" is recorded on Table 2.7. The Boreal Region is influenced by cold Arctic air for most of the winter, and by westerly air flows which have lost much of their moisture during the summer. The Subboreal and Interior Wet Belt Regions are most directly influenced by westerly air flows which release considerable quantities of moisture (as rain and snow) in rising over the Rocky Mountains and higher portions of the Interior Plateau. The Subboreal Region is more susceptible than the Interior Wet Belt Region to the influences of cold, dry Arctic air during winter.

Each forest region may be subdivided into vegetation zones on the basis of vertical (or altitudinal) variations in the floristic composition of the tree canopy. Typically, the lowest-elevation vegetation zone within each forest region constitutes the most authentic reflection of macroclimatic conditions within the region, and functions as an important diagnostic indicator in the definition of regional boundaries. At higher elevations, regional macro-climatic influences tend to be subordinated to the local climatic tendencies which normally accompany altitudinal increases, such as increasing precipitation and/or decreasing temperature. Moreover, the numbers of dominant plant species tend to decrease as elevation increases. Thus corresponding higher-elevation zones within contiguous forest regions may contain very similar plant communities, although certain floristic differences are detectable. Under such circumstances, it is frequently difficult to trace forest region boundaries through higher-elevation vegetation communities.

Table 2.7 compares the distribution of the biophysical forest zones and subzones in the study area with biogeoclimatic zones and subzones mapped by (Meidinger, et al 1984). The horizontal divisions show relative overlaps of the two zonation systems - though the names are very different, the ecological entities are very similar. The biogeoclimatic system has divisions based on a stronger emphasis on understory species' distribution and a less rigid emphasis on distribution of tree species. Because of the closeness of the divisions between systems, it will be relatively easy to correlate soils classification and mapping, based on biophysical forest zones, with the Ministry of Forests biogeoclimatic units.

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[1] Refer to "Vegetation Resources of the Northeast Coal Study Area 1977-78", in preparation, for a complete vegetation description.

Table 2.7
Comparison of Biophysical Forest Zonation and Biogeoclimatic Zonation for the Study Area

BIOPHYSICAL FOREST ZONES/SUBZONES	BIOGEOCLIMATIC ZONES/SUBZONES	
Subboreal white spruce - alpine fir zone: common paper birch subzone (SBwS-alF:b)	Sub-Boreal Spruce Zone: Wet Rocky Mountain Sub-Boreal Spruce Subzone[1] (SBS f)	
Interior western red cedar - white spruce zone (IwC-wS)		Sub-Boreal Spruce Zone: Moist Rocky Mountain Sub-Boreal Spruce Subzone (SBS g)
Interior western hemlock - western red cedar zone (IwH-wC)	Interior Cedar - Hemlock Zone: Very Wet Northern Interior Cedar Hemlock Subzone[2] (ICH f)	Interior Cedar - Hemlock Zone: Wet Northern Interior Cedar Hemlock Subzone[2] (ICH k)
Subalpine Engelmann spruce - alpine fir zone: forested subzone (SAes - alF:a)	Engelmann Spruce - Subalpine Fir Zone: Wet Rocky Mountain Forested Subzone (ESSF n)	Engelmann Spruce - Subalpine Fir Zone: Moist Rocky Mountain Forested Subzone[3] (ESSF m)
Subalpine Englemann spruce - alpine fir zone: krummholz subzone (SAes - alf:b)	Engelmann Spruce - Subalpine Fir Zone: Rocky Mountain Parkland Subzone (ESSF p)	Engelmann Spruce - Subalpine Fir Zone: Rocky Mountain Parkland Subzone[3] (ESSF p)
Alpine tundra zone (At)	Alpine Tundra Zone: Hart Ranges Subzone (AT p)	Alpine Tundra Zone: Northern Park Ranges Subzone[3] (AT o)

[1] A boundary across the Rocky Mountain Trench from Dome Mountain to Holy Cross Mountain divides the Wet subzone (northwest) from the Moist subzone (southeast).

[2] A boundary across the Rocky Mountain Trench from Dome Mountain to Holy Cross Mountain divides the Very Wet subzone (northwest) from the Wet subzone (southeast).

[3] This zone or subzone only occurs on the southeastern corner of the study area, southeast of East and Cushing Creeks.

Within the Study Area, the three forest regions may be subdivided into the following vegetation zones:

Subboreal Region

- Subboreal white spruce - alpine fir zone[1]
- Subalpine Engelmann spruce - alpine fir zone
- Alpine tundra zone

Interior Wet Belt Region

- Interior western red cedar - white spruce zone
- Interior western hemlock - western red cedar zone
- Subalpine Engelmann spruce - alpine fir zone
- Alpine tundra zone

Boreal Region[2] (occurs just on the northeast border of the study area)

- Boreal white spruce zone
- Subalpine Engelmann spruce - alpine fir zone
- Alpine tundra zone (believed absent)

It should be noted that two major alterations have been introduced into the system of forest zonation for the Northeast Coal Block since the publication of the 1976-1977 ELUSC Report. Firstly, a new zone, the Interior western red cedar - white spruce zone, has been recognized within the Interior Wet Belt Region. Secondly, the identification of two separate subzones (the balsam poplar and black spruce subzones) within that part of the Boreal white spruce zone which occurs within the Northeast Coal Block, has been deleted. It is now suggested that differences in seral forests in this zone (within the Northeast Coal Block) are a reflection of variations in the nature of the dominant parent materials across the region rather than variations in macro-climate. Since macroclimatic differences are the basis for any delineation of subzones, the Boreal white spruce zone is now considered to be represented by only one subzone (the black spruce subzone) within the region of study. In addition to these two major changes, some minor refinement of zonal lines on the zonation maps has occurred.

Intrazonal vegetation types are also recognized within the Study Area. These are vegetation types such as wetlands which are determined by local (edaphic) conditions, perhaps related to terrain or soil or micro-climate, rather than by broad climatic (or zonal) influences. Thus, these vegetation types may occur within several different vegetation zones and yet exhibit similar or identical floristic composition and structure.

The division of the Study Area into biophysical forest regions is illustrated in Figure 2.4., while the vegetation zonation for the region is depicted in a generalized form in Figure 2.5.

[1] The name "subalpine fir", which was employed extensively in the 1976-1977 ELUSC Report, has been replaced by "alpine fir" throughout the present report in order to conform with conventional usage.

[2] Due to the very minor occurance of this region inthe Study Area the soils were not stratified or mapped in this region. They were mapped however in the Boreal Region for the Northeast Coal "Core" Study Area, which begins on the northern border of this study area.

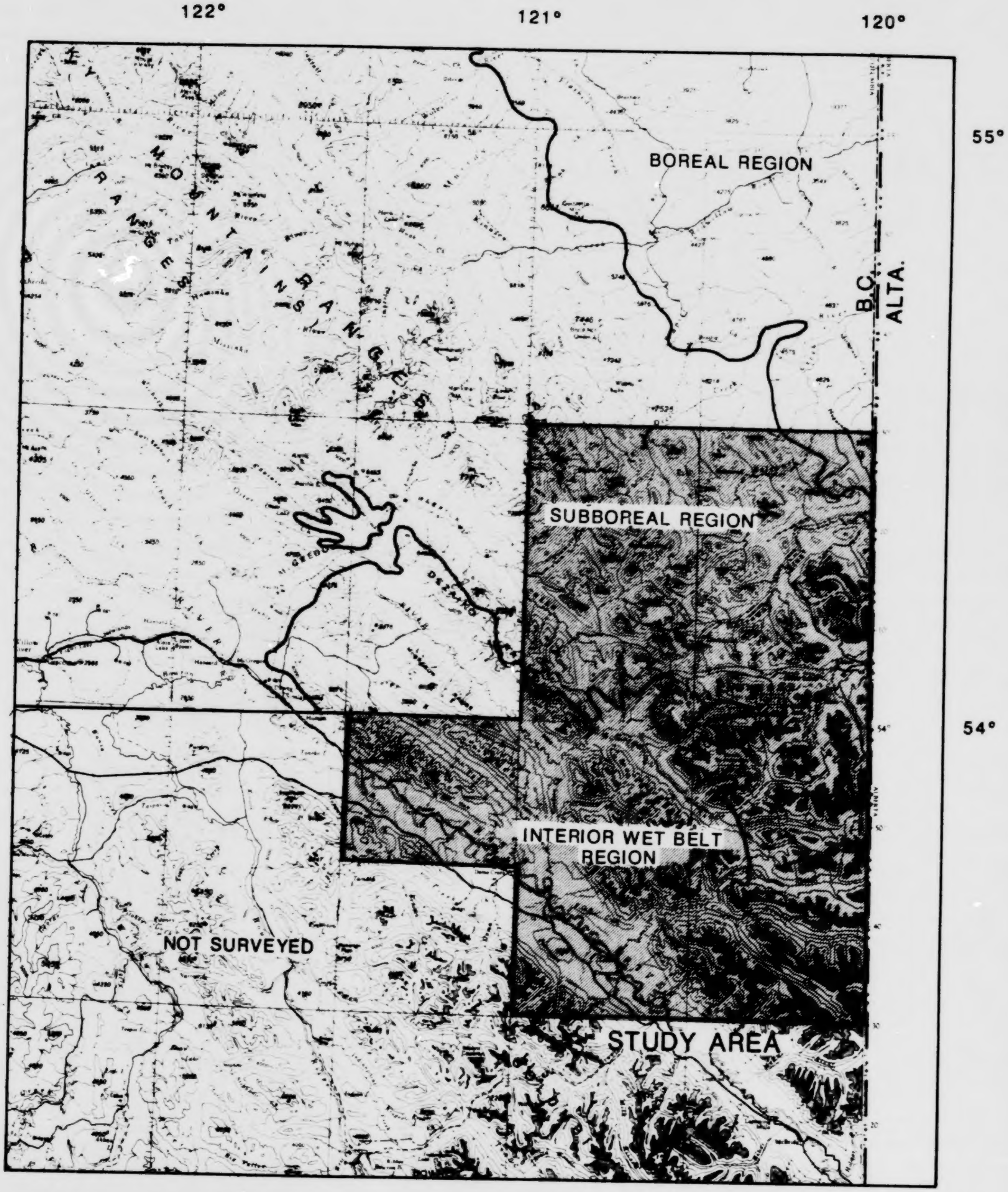

122°
121°
120°
55°
54°
BOREAL REGION
SUBBOREAL REGION
INTERIOR WET BELT REGION
NOT SURVEYED
STUDY AREA
B.C.
ALTA.
ROCKY MOUNTAINS RANGES

Figure 2.4 Forest regions.

2.5.1 The Subboreal Region

Within the Study Area, the Subboreal Region corresponds geographically with the Rocky Mountain Foothills, the western and northern portions of the Rocky Mountains, and the northern portions of both the McGregor Plateau and the Rocky Mountain Trench. The macroclimate of the Subboreal Region is considerably modified by both elevation and topography, but could generally be described as "humid continental".

a) Subboreal white spruce - alpine fir zone

Climatic climax forests of this zone feature a mixture of alpine fir and white spruce (or a hybrid of white and Engelmann spruce) as the dominant tree species. Western thimbleberry and blueberries occur in the shrub layer, and Canadian bunchberry, five-leaved creeping raspberry, trifoliate-leaved foamflower and oak fern are common in the herb layer. The dominant mosses are feather moss and common moss.

Two subzones have been recognized within the Subboreal white spruce - alpine fir zone on the basis of potential differences in seral tree components. Areas where Douglas-fir is likely to occur as a seral tree species on medium-textured soils have been included within the Douglas-fir subzone. Within the Study Area, this subzone is restricted to lower sections of the Fraser and McGregor River valleys, reflecting the drier and warmer influences of the Dry Interior Region to the south. At other sites within the zone, it does not appear that Douglas-fir is present as a seral tree species on medium-textured soils, although it may occur where local (edaphic) conditions, such as soil shallowness or a southern aspect, modify macro-climatic influences. Such sites are included within the common paper birch subzone, which is found in valley bottoms on both sides of the Rocky Mountains. This subzone tends to be cooler than the Douglas-fir subzone; it experiences a higher incidence of cold Arctic air intrusions, and slightly higher precipitation.

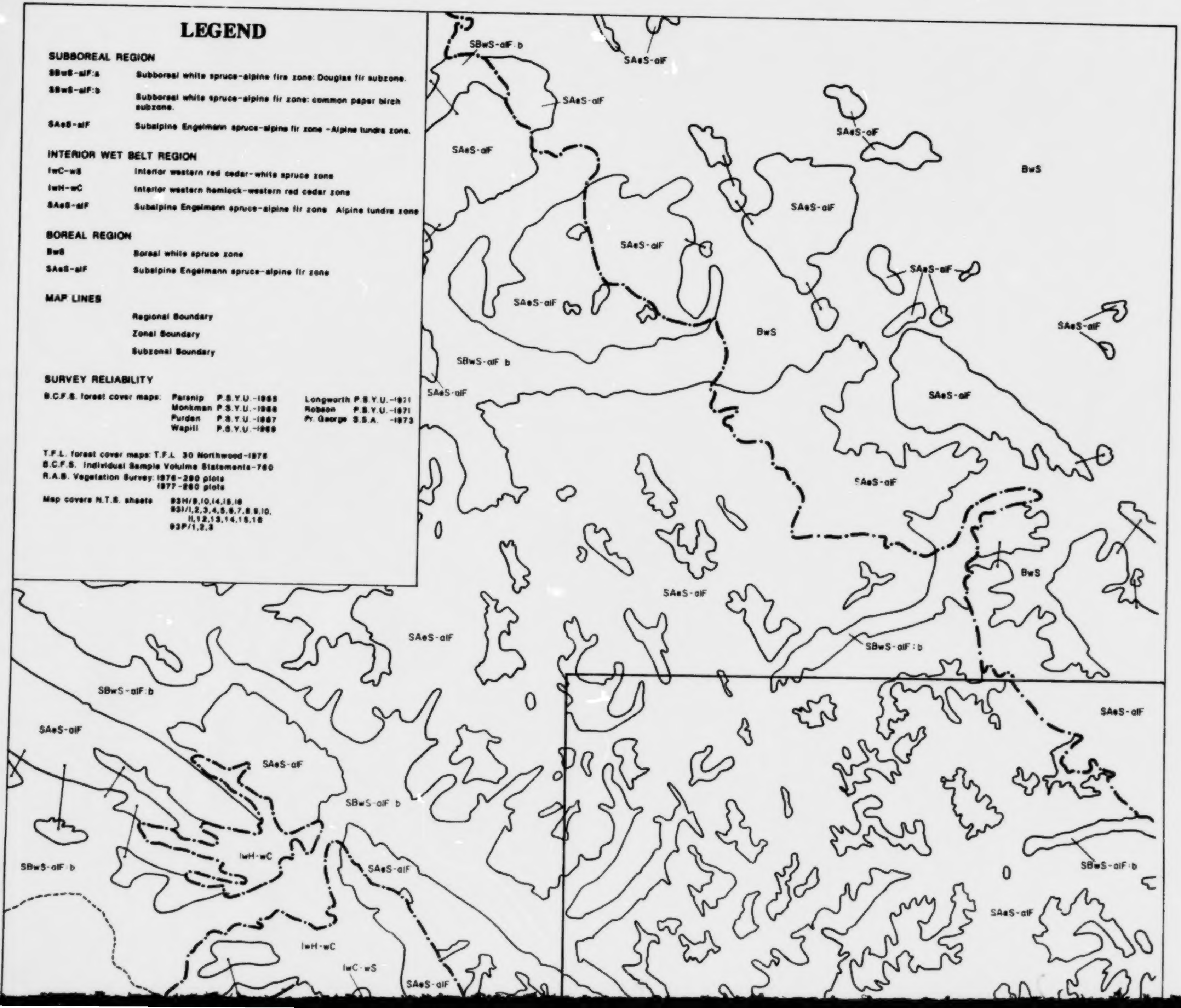
There is a considerable variation in vegetation types across the zone. This is largely attributable to the variability of soil moisture regimes. The seral stages of post-fire successions are characterized by the presence of lodgepole pine and, in some cases, trembling aspen or common paper birch. Differences in seral conditions probably result from variations in the nutrient status of the soil parent materials.

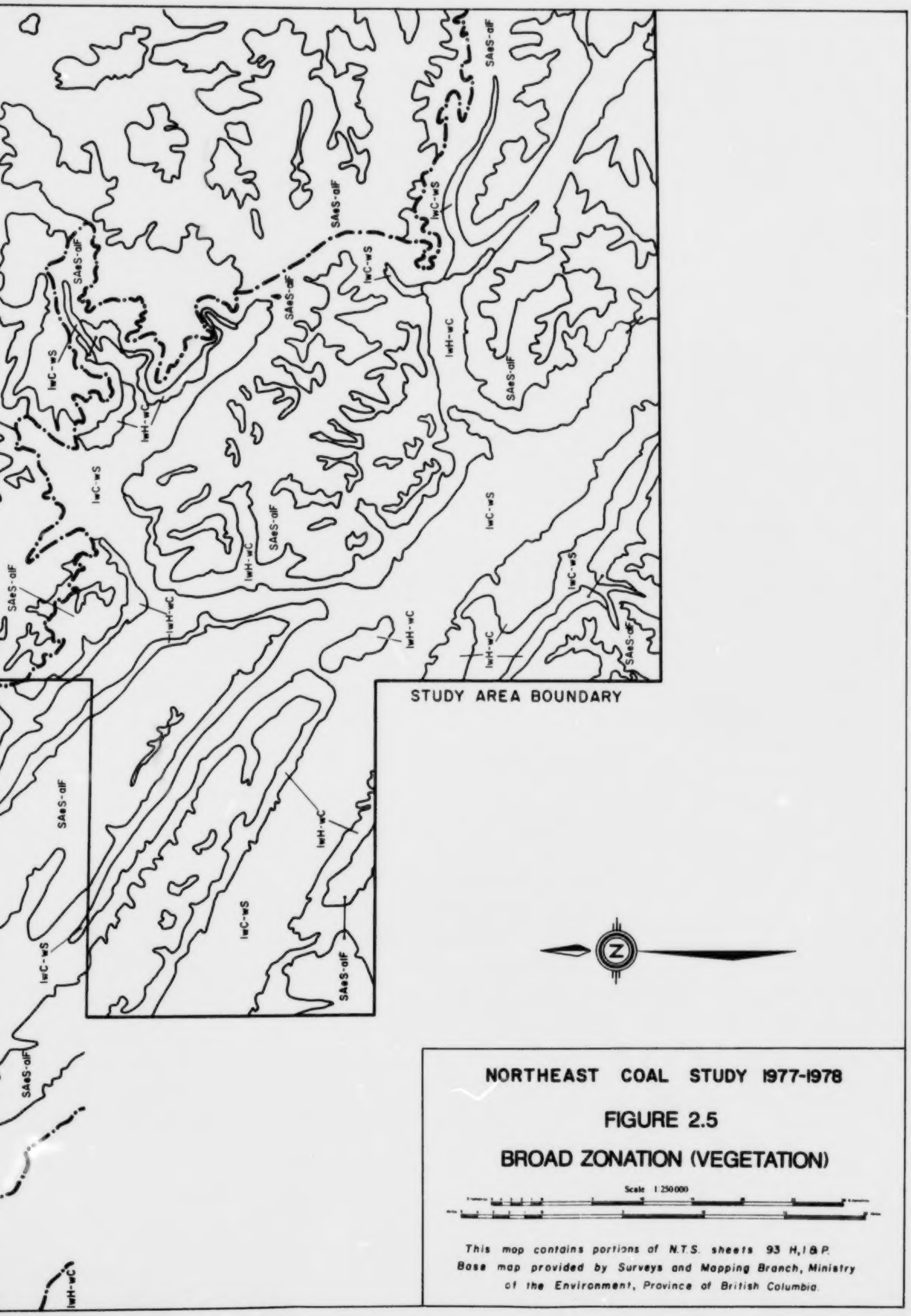
The Subboreal white spruce - alpine fir zone occurs only below 1,300 metres above sea level.

b) Subalpine Engelmann spruce - alpine fir zone

The tree layer of climax forests within this zone contains Engelmann spruce and alpine fir. The shrub layer commonly includes white-flowered rhododendron and black blueberry; the herb layer includes broad-leaved arnica, Sitka valerian and green false hellebore, and the moss layer includes liverworts and some moss species.

This zone is very extensive in the Study Area, but displays relatively little floristic variation. Two subzones may be distinguished: (i) a forested subzone at lower elevations; and (ii) a krummholz subzone at higher elevations. This division is based more on vegetation physiognomy (appearance) than on variations in floristic composition. The krummholz subzone is characterized by clumps of stunted trees and open tundra. Subalpine meadows, which are comprised of showy


LEGEND
SUBBOREAL REGION
SBwS-alF:a Subboreal white spruce-alpine fire zone: Douglas fir subzone.
SBwS-alF:b Subboreal white spruce-alpine fir zone: common paper birch subzone.
SAeS-alF Subalpine Engelmann spruce-alpine fir zone -Alpine tundra zone.
INTERIOR WET BELT REGION
IwC-wS Interior western red cedar-white spruce zone
IwH-wC Interior western hemlock-western red cedar zone
SAeS-alF Subalpine Engelmann spruce-alpine fir zone Alpine tundra zone
BOREAL REGION
BwS Boreal white spruce zone
SAeS-alF Subalpine Engelmann spruce-alpine fir zone
MAP LINES
Regional Boundary
Zonal Boundary
Subzonal Boundary
SURVEY RELIABILITY
B.C.F.S. forest cover maps:
Parsnip P.S.Y.U.-1965
Monkman P.S.Y.U.-1966
Purden P.S.Y.U.-1967
Wapiti P.S.Y.U.-1969
Longworth P.S.Y.U.-1971
Robson P.S.Y.U.-1971
Pr. George S.S.A. -1973
T.F.L. forest cover maps: T.F.L. 30 Northwood-1976
B.C.F.S. Individual Sample Volulme Statements-760
R.A.B. Vegetation Survey: 1976-290 plots
1977-260 plots
Map covers N.T.S. sheets 93H/9,10,14,15,16
93I/1,2,3,4,5,6,7,8,9,10,
11,12,13,14,15,16
93P/1,2,3
SBwS-alF:b
SAeS-alF
SAeS-alF
SAeS-alF
BwS
SAeS-alF
SAeS-alF
SAeS-alF
SAeS-alF
BwS
SAeS-alF
SBwS-alF:b
SAeS-alF
SAeS-alF
SAeS-alF
SAeS-alF
BwS
SAeS-alF
SBwS-alF:b
SAeS-alF
SBwS-alF:b
SAeS-alF
SAeS-alF
SBwS-alF:b
IwH-wC
SAeS-alF
SBwS-alF:b
SBwS-alF:b
SAeS-alF
IwH-wC
IwC-wS
SAeS-alF


SAeS-alF
IwC-wS
IwH-wC
STUDY AREA BOUNDARY
N
Scale 1:250000

NORTHEAST COAL STUDY 1977-1978

FIGURE 2.5

BROAD ZONATION (VEGETATION)

This map contains portions of N.T.S. sheets 93 H, I & P. Base map provided by Surveys and Mapping Branch, Ministry of the Environment, Province of British Columbia.

sedge, Sitka valerian and Arctic lupine, develop on wetter soils. Within the forested subzone, a dense closed forest is usually present, with lodgepole pine being the most abundant seral species.

The forested subzone experiences more moderate climatic conditions than the krummholz subzone, within which climatic conditions are so severe that hardy tree species such as alpine fir are able to survive only when established during milder-than-average conditions. Nutrient cycling and the fixing of energy to form plant material are very slow processes. For these reasons, krummholz vegetation is very sensitive to disturbance. Revegetation of disturbed sites may take several centuries.

The Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region occurs in the Study Area at elevations ranging from 1,100 to 1,800 metres above sea level. The boundary between the lower forested and upper krummholz subzones is located at an elevation of approximately 1,600 metres above sea level.

c) Alpine tundra zone

The Alpine tundra zone is characterized by tundra-like vegetation which is dominated by dwarf shrubs and semi-shrubs such as dwarf blueberry, alpine-azalea, four-angled cassiope, Mertens' cassiope, both red and cream mountain-heather, net-leaved dwarf willow, entire-leaved white mountain-avens, and white mountain-avens.

The extreme tundra climate, together with the highly localized variations in other environmental factors, have combined to produce a complex mosaic of numerous micro-communities. No attempt has been made, however, to define subzones within the zone.

The soil parent materials appear to be the most important factor in determining the floristic composition of plant communities in the Alpine tundra zone. Bedrock with a basic chemical composition tends to support entire-leaved white mountain-avens and net-leaved dwarf willow. Bedrock with an acidic chemical composition tends to support dwarf blueberry and alpine-azalea. Variations in wind exposure, solar radiation, snow accumulation, and other microclimatic factors also exert a strong influence on the composition of plant communities at each specific site. Geomorphological processes such as cryoturbation, solifluction and nivation operate at very rapid rates, and tend to influence variations in vegetation structure. Reclamation of disturbances within alpine areas requires even more time than within subalpine krummholz areas.

The Alpine tundra zone of the Subboreal Region is generally restricted to locations above 1,800 metres above sea level within the Study Area.

d) Intrazonal vegetation communities

A variety of wetland plant communities have been identified in all zones of the Subboreal Region except the Alpine tundra zone. These wetlands may be grouped into four major vegetation types.

Fens are characterized by sedges such as Sitka sedge and water sedge, and by glandular birch. Peat bogs contain cotton-grass, common Labrador tea, lodgepole pine, black spruce, and several different species of peat moss. Transition bogs represent a transition between fens and peat bogs with respect to their nutritional status, and host a well-defined flora, including shore sedge, tufted deer-grass and cordroot sedge. Frequently, fens, peat bogs and transition bogs occur in close association, creating a complex mosaic of plant communities.

Calcareous bogs occur only rarely in the Study Area, but are of great importance to wildlife in cases where they provide mineral licks. They also host many rare plant species and are of potentially great scientific value. Rare plants include simple kobresia, three-flowered rush, Greenland primrose, Hudson Bay deer-grass and common false asphodel.

2.5.2 The Interior Wet Belt Region

The Interior Wet Belt Forest Region overlaps southern and southeastern portions of the Rocky Mountains, the McGregor Plateau and the Rocky Mountain Trench. The climate of the Interior Wet Belt Region is characterized by higher precipitation and, consequently, deeper snow-packs than the Subboreal and Boreal Regions, and there tends to be an abundance of moisture throughout the year.

a) Interior western red cedar - white spruce zone

This zone is floristically very similar to the Subboreal white spruce-alpine fir zone. The dominant tree species are white spruce and alpine fir, while western red cedar is also a significant constituent. The shrub layer usually includes twinberry honeysuckle and western thimbleberry; the herb layer, large round-leaved rein orchid; and the moss layer, feather moss. Seral stages are represented by lodgepole pine, common paper birch or trembling aspen.

Typically, this zone is confined to valley bottoms where the ready availability of moisture encourages western red cedar. These areas are frequently exposed to the damaging effects of advective and radiation frosts at elevations below 800 metres above sea level. The frost action probably eliminates western hemlock.

b) Interior western hemlock-western red cedar zone

The characteristic flora within the forests of this zone include western hemlock, western red cedar, white spruce and alpine fir in the tree layer; western thimbleberry and devil's-club in the shrub layer; wild sasaparilla and simple-stemmed twistedstalk in the herb layer; and layered moss and red-stemmed pipecleaner moss in the moss layer.

Plant communities in this zone are primarily influenced by both surficial geology and edaphic conditions. Stunted and unproductive forests tend to develop on poorly drained deposits, whereas fluvial terraces and colluvial fans tend to sustain relatively productive timber stands.

Lodgepole pine and trembling aspen are the major seral species within the Study Area, although Douglas-fir is an important seral species within this vegetation zone in areas to the southeast of the Study Area. Within the Study Area, Douglas-fir occurs only sporadically, mainly on south-facing slopes.

This zone is the characteristic zone of low-elevation areas within the Interior Wet Belt Region. The upper boundary elevation of the zone varies from 1,100 to 1,300 metres above sea level, depending on aspect and slope gradient.

c) Subalpine Engelmann spruce - alpine fir zone

The floristic composition of this zone is very similar to that of its counterpart in the Subboreal Region. However, the higher snowfalls and deeper snowpacks which occur within the Interior Wet Belt Region commonly cause tree damage and a corresponding overgrowth of shrubs. Moreover, avalanches tend to lower the timber line: these tracts result in the establishment of extensive shrubby alder stands.

Within the Interior Wet Belt Region, this zone is found at elevations which range from 1,100 to 1,800 metres above sea level.

d) Alpine tundra zone

The composition of vegetation and the observed relationships between vegetation and other environmental factors in this zone appear to be very similar to those in its Subboreal counterpart.

The preponderance of acidic bedrock within this zone has resulted in a greater uniformity of the alpine tundra plant communities than in the Alpine tundra zone of the Subboreal Region. As in the Subboreal Region, the Interior Wet Belt Alpine tundra zone is confined to elevations in excess of 1,800 metres above sea level.

e) Intrazonal vegetation communities

The comments which were presented previously for intrazonal vegetation in the Subboreal Region are applicable in the Interior Wet Belt Region also.

2.5.3 The Boreal Region

The Boreal Region occurs in northeastern portions of the Study Area, overlapping two physiographic regions, the Alberta Plateau Benchlands and the Rocky Mountain Foothills. Vegetation in the Boreal Region reflects the influence of cold, relatively dry air which moves into the region as part of polar air systems. Winters are very cold, precipitation is limited, and the growing season is short.

a) Boreal white spruce zone

This zone extends up to 1,130 metres above sea level on the Alberta Plateau Benchlands, and slightly lower elevations in the Rocky Mountain Foothills. Climatic aspect has little effect on the zone since it occurs largely in areas of rolling and undulating terrain. Consequently, plant communities in the zone tend to be of relatively uniform character. The major sources of differentiation are the soil substrate characteristics, especially soil moisture.

As noted at the beginning of this discussion of vegetation zonation, it is now believed that the Boreal white spruce zone is represented by a single subzone (the black spruce subzone) within the general region of study, although a major edaphically-induced transition in the dominant seral forests may be observed. Within the 1977-1978 Study Area, lodgepole pine is the dominant seral species, except on finer-textured surficial materials where trembling aspen dominates. Black spruce occurs commonly under lodgepole pine stands on coarse-textured materials with low pH and poor nutrient status, and is expected to form an edaphic climax on these materials. Black spruce is also mixed with tamarack on organic soils. Much of the zone is underlain by morainal or colluvial deposits on which the zonal white spruce climax is expected.

North of the 1977-1978 Study Area (within both the 1976-1977 Study Area and the Peace River Valley), finer-textured materials occur more frequently, and tend to be associated with seral stands of trembling aspen and balsam poplar which also lead to a white spruce climax. In these areas, lodgepole pine is relatively uncommon, and black spruce is confined to organic soils.

b) Subalpine Engelmann spruce - alpine fir zone

Comments which were presented previously for the Subboreal Region counterpart of this zone are largely applicable in the Boreal Region. However, within the latter region, the Subalpine Engelmann spruce - alpine fir zone occurs within a somewhat narrower elevational range, 1,130 to 1,700 metres above sea level.

Hybridization of Engelmann spruce and white spruce occurs throughout the zone between 1,220 and 1,400 metres above sea level. Within the Boreal Region, black spruce may occur with lodgepole pine which is the dominant seral species. Alpine fir and white-flowered rhododendron are indicator species of subalpine areas which are situated within the Boreal Region.

c) Alpine tundra zone

This zone is not present in the Study Area within the Boreal Region.

d) Intrazonal vegetation communities

Comments which were presented previously for intrazonal communities within the Subboreal Region are generally applicable to the Boreal Region.

2.6 REGIONAL SOIL RESOURCES

The soil associations which have been recognized within the Study Area are classified mainly according to soil parent material soil development, macroclimate (as reflected by forest zonation), and physiographic region.

The 1973 revised edition of the System of Soil Classification for Canada was used for classifying the soils of the Jarvis Creek - Morkill River map area. If the revised criteria for the Podzolic Soil Order as defined in the 1978 edition had been used, some of the soils in the Interior western hemlock - western red cedar and Subalpine Engelmann spruce - alpine fir forest zone would have been classified in the Brunisolic Soil Order rather than in the Podzolic Soil Order as they are at present. Classification of the soils was not updated due to the considerable time needed for additional sampling and revision of soil maps. This should not affect the use of the information contained in the report as the basic characteristics as reported upon will not change. Tentative correlations between 1973 and 1978 soil classifications is given in Appendix F.

Soil parent materials in the Alberta Plateau Benchlands[2] consist mainly of medium-textured morainal deposits. Clay accumulations in the soil are common, inhibiting both water movement and root penetration. Gleyed, imperfectly drained soils indicated by greyish green colours and mottling are frequently found on long seepage slopes with gradients in excess of 15 percent. Such slopes are susceptible to slumping or surface erosion if disturbed by road construction or other similar activities. In general, the medium textures and imperfect drainage of these soils pose moderate to severe technical problems for both transportation development and building construction. Soils which occur on these till deposits generally fall into the Luvisolic Soil Order[1].

Colluvial deposits (those which have originated through mass wasting), occur over both sandstone and shale within the Benchlands. There has been no significant leaching of clay particles to accumulation zones at depth so that soil horizonation tends to be weak. Soil development is inhibited by the continuous exposure of fresh bedrock fragments. The soils which occur on these material were classified into the Brunisolic order. The colluvial soils usually mantle steeply-sloping areas and offer little potential for urban development. Limitatiors for transportation development do exist, but with adequate engineering studies and applications such limitations can be overcome.

Gravelly and sandy sediments of fluvial origin which are no longer subject to flooding may exhibit either Luvisolic or Brunisolic development. These sediments, especially the gravels, are generally suitable for urban and transportation development. The deposits on active floodplains are dominantly sandy in texture, and their soil development is being more or less continually arrested by flooding. The soils classified on these deposits fall into the Regosolic order. Flooding imposes severe limitations on urban development, and, depending on flood frequency and intensity, may also place moderate or severe restrictions upon transportation development.

Soil parent materials in the Rocky Mountain Foothills are generally shallow, medium-textured, and moderately weathered. The soils of this region fall into four general groupings, the groups being located within fairly well-defined elevational ranges.

The first group of soils is found along valley floors at elevations between 1,070 and 1,570 metres above sea level, and is located within the Subboreal white spruce - alpine fir and Subalpine Engelmann spruce - alpine fir vegetation zones. The soils have developed mainly in morainal materials, and exhibit Brunisolic or Luvisolic development. The soils are typically of fine and medium texture, and are usually calcareous as a consequence of the high limestone content of the moraine. In general, the soils are relatively suitable for most forms of transportation and urban development. However, they are not deeply weathered so that exposure of the limey near-surface subsoil will likely retard vegetation regeneration on disturbed sites. Areas of gravelly and sandy fluvial sediments along rivers have characteristics which are similar to those described above for the Alberta Plateau Benchlands.

The second group of soils has developed from morainal deposits on long lower valley slopes at elevations between 1,300 and 1,525 metres above sea level within the Subalpine Engelmann spruce-alpine fir zone. Soil characteristics are similar to those for morainal soils along the valley floors. Soils which have developed from shallow colluvial materials are also common, and are relatively poorly compacted compared with the morainal soils. The matrices of these relatively acidic Brunisols consist of a dark, loamy, angular, shaly material which extends to a general depth of 50 centimetres. Existing road construction has usually extended beneath the shallow colluvial soil into the underlying bedrock. Limitations to transportation development on colluvial slopes of less than 30 percent are generally low.

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[1] For definitions of soil taxonomic terms, see: Canada Department of Agriculture. 1974. The System of Soil Classification for Canada. Publ. 1455. Ottawa. 255 pp.

[2] Soils occurring in this region were located just northeast of the study area; see Vold, T. *et al.* (1977).

The third group of soils is located on upper slopes at elevations ranging from 1,460 to 1,830 metres above sea level within the forested and krummholz subzones of the Subalpine Engelmann spruce - alpine fir zone. This group of soils has developed in shallow rubbly colluvium. The soft, erodible nature of the shale parent material on steeper slopes tends to retard soil development; here Brunisolic soil development dominates. However, on the more stable slopes in the krummholz subzone, Podzolic development is common. Podzols are weathered soils which are characterized by amorphous combinations of organic matter, iron and aluminium in the upper soil horizons. The combination of actively eroding scree slopes, periglacial processes such as frost heaving, and steep terrain imposes severe limitations upon any form of urban or transportation development within this elevational range.

The fourth group of soils occurs on the upper slopes and summits of mountains at elevations greater than 1,830 metres. This group occurs within the upper krummholz subzone of the Subalpine Engelmann spruce - alpine fir zone, and the Alpine tundra zone. The very shallow rubbly colluvial soils are subject to severe frost heaving, solifluction and nivation processes which retard soil development to such an extent that Regosolic development dominates. Approximately 50 percent of the terrain in this area consists of steeply sloping exposed bedrock upon which the accumulation of a soil mantle is inhibited. The severe climatic and topographic conditions pose very severe technical problems for most types of development.

It should be noted that colluvial parent materials which have been derived from coals and carbonaceous shales are relatively extensive above 1,525 metres above sea level, particularly in the Saxon Ridge area. Tested soils in this area proved to be highly acidic and to have high carbon contents. These chemical properties may create problems in using such soils for reclamation projects.

Soil parent materials in the Rocky Mountains are derived from two fairly distinct bedrock groups. To the east of the Continental Divide, bedrock sources include limestone, dolomite, quartzite and minor conglomerate, siltstone, sandstone and shale. These materials weather into coarse-textured and medium-textured calcareous soils. To the west of the Divide, silty lacustrine, morainal and colluvial parent materials have originated from fine-grained phyllites, schists, shales and other metamorphic rocks. Here the Podzolic soils are deeply-weathered - a reflection of the high levels of precipitation to the west of the Divide. This contrasts with the shallow Podzolic and Brunisolic development to the east of the Divide, where conditions are drier and leaching processes are less active.

Two different types of valley setting are characteristic to the east of the Divide. Broad, flat valleys feature generally shallow overburdens of calcareous moraine and colluvium, upon which lithic (shallow) Podzolic and Brunisolic soils typically occur adjacent to exposed rock scarps and terraces. Soil drainage is highly variable, and extremes include poorly-drained depressions adjacent to droughty knolls and rock terraces. Depending upon the soil depth and slope gradient, soil limitations for urban and transportation development may vary from moderate to severe. Narrow, V-shaped valleys are characterized by deep, stony colluvial and morainal materials which support Podzolic, Luvisolic and Brunisolic soil development. These soils are moist, calcareous at depth, and exhibit numerous erosion-prone seepage sites. As a result of generally steeper slope gradients, seepage concentrations and snow avalanche activity, these soils are very sensitive to both slippage and erosion when disturbed.

To the east of the Divide, valley sides are steep and are typically mantled by a rubbly, calcareous colluvium. Extensive slopes of colluvium and active talus support Brunisols and Regosols, while more stable sites support Podzols. Most of these soils are droughty and sufficiently unstable to pose major problems for development.

On the west side of the Continental Divide, most valley floors feature deep deposits of silty lacustrine materials. The soils which have developed in these materials are podzolized near the surface and exhibit luvisolic clay accumulations in soil horizons which occur at depths of approximately 40 to 80 centimetres. During the spring thaw (and at other times of surface moisture abundance), water becomes perched upon these impervious clay horizons, creating potential slippage planes and conditions which are suitable for puddling. Consequently, these soils are highly susceptible to erosion, particularly if urban, transportation or forestry developments are inadequately designed.

Active fluvial materials on the western flanks of the Rocky Mountains are characterized by Regosolic soil development. Seasonal flooding imposes severe constraints upon most types of industrial development. Inactive fluvial terraces which are not threatened by stream undercutting are suitable for both urban and transportation development.

At higher elevations within the Interior Wet Belt Forest Region, which occupies the valleys along the western flanks of the Rocky Mountains, colluvial and morainal veneers overlie soft, erodible, acidic bedrock slopes. Slope gradients are usually in excess of 40 percent. The soils are Podzolic and frequently gleyed as a result of transmitting large volumes of seepage laterally downslope during the spring and early summer. Development constraints tend to be high, although well-drained soils which have developed from deeper, relatively stable, morainal and colluvial deposits are moderately suitable for transportation development. The latter soils generally occur at lower elevations.

Throughout the Rocky Mountain region, most higher-elevation soils (within the Subalpine Engelmann spruce - alpine fir zone) are cold and moist (often saturated), the moisture originating as meltwater from snowpacks and ground ice. Consequently, forest growth rates are generally low. All soils which are situated above 1,675 metres above sea level are highly unsuited for urban or transportation development.

The dominant materials of the McGregor Plateau are morainal and fine-textured lacustrine deposits in which both Luvisolic and Podzolic soils have developed. The soils are highly susceptible to surface erosion and gullying and, depending upon the topography, may pose moderate to severe problems for urban and transportation development. Organic and floodplain deposits commonly occur along the bottomlands of the McGregor and Fraser valleys, posing severe technical problems for development.

The Rocky Mountain Trench consists primarily of morainal, lacustrine and inactive and active fluvial materials. The dominant soil developments here are both Podzolic and Luvisolic. In the valley bottoms, organic accumulations and poorly-drained floodplain materials are common, for example within the Fraser and McGregor River valleys. The soils which have developed in these materials impose severe technical constraints upon both urban and transportation development. The Rocky Mountain Trench is located within the low-elevation forests of both the Subboreal and Interior Wet Belt Forest Regions.

The soil parent materials in the Cariboo Mountains consist primarily of colluvium and morainal with active and inactive fluvial sediments occurring on the narrow valley floors. The soil development is dominantly Podzolic and the soils are usually moist throughout the growing season with numerous inclusions of gleyed podzols subject to seepage. The frequent inclusions of seepage sites coupled with the steeper slopes makes planning for erosion control an important concern. Only a small portion of the study area occurs in the Cariboo Mountain physiographic region. Soil associations belonging to the Rocky Mountains region were suitable for use in this minor eastern portion of the Cariboo Mountains.

Soil parent materials of the McGregor Plateau, which occur only to a minor extent, are also similar to those in the Rocky Mountain region.

CHAPTER THREE

DESCRIPTIONS OF THE SOIL ASSOCIATIONS, THEIR ENVIRONMENT AND COMMENTS ON LAND USE

3.1 MAPPING METHODS AND SOIL SURVEY

Mapping Methodology

The Physiographic Regions as described by Holland (1964) provide the broadest physical stratification of the soil associations.

The second level of stratification is forest zones as reflected by dominant climatic climax vegetation. The third level of stratification is bedrock groupings (which, from the point of soil development, produce soil parent material similar in characteristics such as texture and chemical properties). At the local level the soil parent materials, as expressed by mappable landforms and soil profile development, formed the basic framework of the soil association, (Table 3.1)).

A soil association is defined as a sequence of soils of about the same age, derived from similar parent materials, and occurring under similar climatic conditions, but having unlike characteristics because of variations in topographic position and drainage. For example, the Holliday soil association (map symbol HL) represents a group of soils developed from colluvial materials which overlie medium-grained bedrock. Under normal environmental conditions, the Holliday soils have Orthic Humo-Ferric Podzol soil development, but within this soil association, variations in soil depth, distinct local climate, and/or moisture regime results in variations in soil profile development and hence soil classification. When these variations become significant (about 20% of the delineated area) they are recognized and mapped as a separate component of the Holliday association.

The dominant soil of a soil association generally consists of one or sometimes two related soil subgroups of one soil great group.

Significant soils in a soil association include soil subgroups of other soil great groups and seepage phases. Seepage phases represent sites which are moister than the usual soils and may include Gleyed subgroups of the appropriate dominant and significant soils within the soil association.

The soil associations are indicated on the soil maps by a two letter symbol, for example, HL. The association components constituting the delineated area are indicated by numbers, for example, HL3, HL5. It is this symbol alone or in combination which constitutes the basic mapping unit. The dominant soil subgroup occupies 40 to 100% of the delineated soil map polygon, with the combined significant soil subgroup(s) and phases occupying 20 to 60%. Soil subgroup(s) occupying less than 20% of a mapping unit are normally not recognized. Component numbers change when the significant soil subgroup inclusions change; this may be due to changes in drainage, depth to bedrock, texture or associated soil development which may in some cases differ due to erosional processes.

Combinations of two or more soil associations are mapped when they occur in a pattern too intermixed to delineate at the scale of mapping. Most complexes used in this survey consist of two separate soil association components eg. HL1/SM7. The portion of the map unit occupied by each soil association is indicated by a slash(s) which indicates an unequal distribution or an equal sign which indicates equal portions of different soil components. The legend attached to each soil map explains the notations in detail. Thus a delineated area designated as HL5/SM7 contains about 60% of the Holliday soil association (component 5) and about 40% of the Sunbeam soil association (component 7).

Survey Procedures and Access

Prior to fieldwork, surficial materials were pretyped on aerial photographs using the E.L.U.C. Secretariat (1976) terrain classification system. Aerial photographs at an approximate scale of 1" = 1 mile (80 chains ± 10%) were used throughout the study area.

Field survey by truck on existing roads and by helicopter in relatively inaccessible areas, provided access for field checking the air-photo interpretations. Soils were examined at each stop and field descriptions were recorded on such soil properties as parent material, horizonation, depth, colour, texture, pH, and drainage. Site characteristics such as slope, elevation, rockiness, aspect, and associated vegetation were also noted on field cards. Soil development was taxonomically described using The System of Soil Classification for Canada (Canada Department of Agriculture, 1970; 1973 Revised).

Following field examinations, which included selective soil sampling and analysis of numerous locations, an initial soil legend for the study area was developed. This legend was modified as new information was added throughout the field season. The final legend is presented in Appendix A and a simplified version is attached to each 1:50 000 scale biophysical soils map.

A representative soil profile of nearly all soil associations in the study area was sampled, morphologically described in detail and analyzed with respect to the physical and chemical characteristics. Detailed soil profile descriptions and laboratory analysis are available for most soil associations by contacting the British Columbia Soil Information System, British Columbia Ministry of Environment, Parliament Buildings, Victoria, British Columbia.

Field checking resulted in modifications of pre-typing, with final lines being plotted on aerial photographs. These boundaries were then transferred to 1:50 000 scale topographic base maps for compilation.

Two separate maps resulted:

(i) terrain maps, which show the distribution of surficial materials and their associated textures, surface expression, and modifying processes; and

(ii) biophysical soil maps, which indicate soil parent material (surficial material), soil development, vegetation zone, drainage class, depth to bedrock, rockiness, and topographic (slope) classes. Indirectly, the soil association descriptions and the expanded soil legend provides much more data regarding each soil and its position on the landscape. Such information includes texture, coarse fragment content, horizonation, colour, pH, structure, and other physical and chemical properties.

Both sets of 1:50 000 maps are available from MAPS-B.C., Surveys and Resource Mapping Branch, British Columbia Ministry of Environment, Parliament Buildings, Victoria, British Columbia, V8V 1X5.

Table 3.1

Stratification of Soils in the Jarvis Creek - Morkill River Area

FOREST ZONATION AND PHYSIOGRAPHIC REGION	SOIL PARENT MATERIAL; SURFICIAL MATERIAL		DOMINANT ASSOCIATED BEDROCK	TEXTURE OR DEGREE OF DECOMPOSITION	SOIL TAXONOMIC CLASSIFICATION	SOIL ASSOCIATION	
						NAME	SYMBOL
Interior Wet Belt Region	Colluvium		Metamorphic and Limestone	gravelly medium	L. O. HFP	Wendle	WD
Interior Western hemlock - western red cedar zone (IwH-wC) and small areas of Interior Western Cedar-white spruce zone (IwC-wS) Rocky Mountain Trench	Morainal (till)		Metamorphic and calc. Sedimentary	medium	P. GL	Lanezi	LZ
	Lacustrine		-	fine	O. GL	Raush	RH
	Fluvial	fans	-	gravelly coarse	O. HFP	Fontoniko	FN
			-	gravelly coarse	O. HFP	Ptarmigan	PM
Interior Wet Belt Region Interior Western Cedar - white spruce zone (IwC-wS) and small areas of Interior Western hemlock - western Red Cedar zone (IwH-wC) Rocky Mountain Trench	Lacustrine		-	fine	BR. GL	Bowes Creek	BW
	Fluvial		-	medium and coarse	CU. R	Guilford	GF
			-	medium and coarse	P. GL	Longworth	LO
			-	coarse	O. HFP	Toneko	TO
	Organic	bog	-	mesic	TY. M	Catfish Creek	CC
		fen	-	fibric	TY. F	Papoose	PO
Interior Wet Belt Region Subalpine Engelmann Spruce - Alpine Fir Zone (SAes-alF) Rocky Mountain, Cariboo Mountains, McGregor Plateau	Colluvium		Metamorphic and Sedimentary	gravelly medium	O. HFP	Holliday	HL
			Metamorphic and Sedimentary	gravelly coarse	L. O. R	Cushing	CS
			Metamorphic and Sedimentary	gravelly coarse	O. R	Tlooki	OO
	Morainal (till)		Metamorphic and Sedimentary	medium	O. HFP	Sunbeam	SM
	Lacustrine		-	medium	O. HFP	Dudzic	DC
			-	medium	DG. EB	Framstead	FR
			-	medium	O. EB	Morkill	ML
	Fluvial		-	gravelly coarse	O. HFP	Forgetmenot	FG
			-	coarse	O. R	Renshaw	RN
	Organic		-	fibric	TY. F	Hominka	HA
Interior Wet Belt Region Alpine tundra Zone (At) Rocky Mountains, Cariboo Mountains, McGregor Plateau	Colluvium		Metamorphic and Sedimentary	gravelly medium	L. TU. R	Teare Mountain	TE

Table 3.1 Stratification of Soils in the Jarvis Creek - Morkill River Area (Continued)

FOREST ZONATION AND PHYSIOGRAPHIC REGION	SOIL PARENT MATERIAL; SURFICIAL MATERIAL		DOMINANT ASSOCIATED BEDROCK	TEXTURE OR DEGREE OF DECOMPOSITION	SOIL TAXONOMIC CLASSIFICATION	SOIL ASSOCIATION	
						NAME	SYMBOL
Subboreal Region Subboreal white spruce - alpine fir zone: common paper birch subzone (SBwS-alF:b) Rocky Mountains	Colluvium		Metamorphic	medium	O. FHP	Barton	BT
	Morainal (till)		Metamorphic	medium	P. GL	Dominion	DO
	Lacustrine		-	medium	BR. GL	Bowron	BO
	Fluvial	fans	-	medium	O. HFP	Abol Mountain	AB
			-	medium and coarse	GL. O. R	McGregor	MG
			-	gravelly coarse	O. HFP	Ramsey	RM
	Organic	fen	-	fibric	.F	Chief	CF
		bog	-	fibric	.F	Moxley	MX
Subboreal Region Subalpine Engelmann spruce - alpine fir zone (SAes-alF) Rocky Mountains and minor inclusions of Rocky Mountain Foothills	Colluvium		Quartzite - calc. Sedimentary	gravelly coarse	O. HFP	Babette	BB
			Limestone	gravelly coarse	O. R	Becker Mountain	BC
			Siltstone - shale	medium and fine	BR. GL	Blue Lake	BE
			Metamorphic - Limestone	gravelly medium	O. HFP	Dezaiko	DZ
			Limestone - shale	gravelly medium	O. HFP	Hedrick	HK
			Limestone - shale	gravelly coarse	O. MB	Myhon	MH
			Limestone	gravelly coarse	L. O. MB	Sheba Mountain	SB
			Limestone and sandstone	gravelly medium	DG. EB	Wendt Mountain	WT
	Morainal (till)		Limestone - shale	gravelly medium	DG. EB	Bastille	BS
			Metamorphic	medium	O. HFP	Beauregard Mountain	BG
			Limestone	medium	BR. GL	Onion Creek	ON
			Quartzite	gravelly medium	O. HFP	Paksumo	PK
			Limestone	gravelly medium and coarse	O. HFP	Paxton Mountain	PX
	Fluvial		-	gravelly coarse	O. HFP	Herrick Pass	HP
			-	gravelly coarse	CU. R	Knudsen Creek	KN
			-	gravelly coarse	O. HFP	Ovington Creek	OV
	Organic		-	fibric	TY. F	Hominka	HA
Subboreal Region Alpine tundra Zone Rocky Mountains	Colluvium		Metamorphic	gravelly medium	L. O. R	Gable Mountain	GM
			Quartzite	gravelly coarse	O. R	Menagin	MN
			Limestone	gravelly coarse	L. O. R	Tsahunga	TS

Table 3.1 Stratification of Soils in the Jarvis Creek - Morkill River Area (Continued)

FOREST ZONATION AND PHYSIOGRAPHIC REGION	SOIL PARENT MATERIAL; SURFICIAL MATERIAL	DOMINANT ASSOCIATED BEDROCK	TEXTURE OR DEGREE OF DECOMPOSITION	SOIL TAXONOMIC CLASSIFICATION	SOIL ASSOCIATION	
					NAME	SYMBOL
Subboreal Region Subalpine Engelmann spruce - alpine fir zone (SAeS-alF) Rocky Mountain Foothills and minor inclusions of Rocky Mountains	Colluvium	Sandstone	gravelly coarse	DG. DYB	Horseshoe	HS
		Sandstone	gravelly coarse	O. HFP	Merrick	MC
		Shale - sandstone	gravelly medium	DG. EB	Minnes	MI
		Sandstone	gravelly coarse	TU. O. R	Palsson	PL
		Sandstone	gravelly medium	O. SB	Reesor	RR
		Sandstone	gravelly coarse	O. R	Torrens	TR
	Morainal (till)	Sandstone	gravelly coarse and medium	DG. EB	Robb	RB
		Sandstone	gravelly coarse and medium	BR. GL	Thunder Mountain	TH
		Sandstone	gravelly coarse and medium	O. HFP	Turning Mountain	TM
		Sandstone	coarse - medium	BR. GL	Footprint	FT
		Sandstone	medium	BR. GL	Hambrook	HB
		Siltstone, sandstone - shale	medium and coarse	O. HFP	Nekik Mountain	NK
	Fluvial	-	gravelly coarse	BR. GL	Five Cabin Creek	FC
		-	gravelly coarse	DG. DYB	Holtslander	HO
	Organic	-	fibric	TY. F	Hominka	HA
Subboreal Region Alpine tundra zone Rocky Mountain Foothills	Colluvium	Sandstone	gravelly medium	TU. OR	Palsson	PL

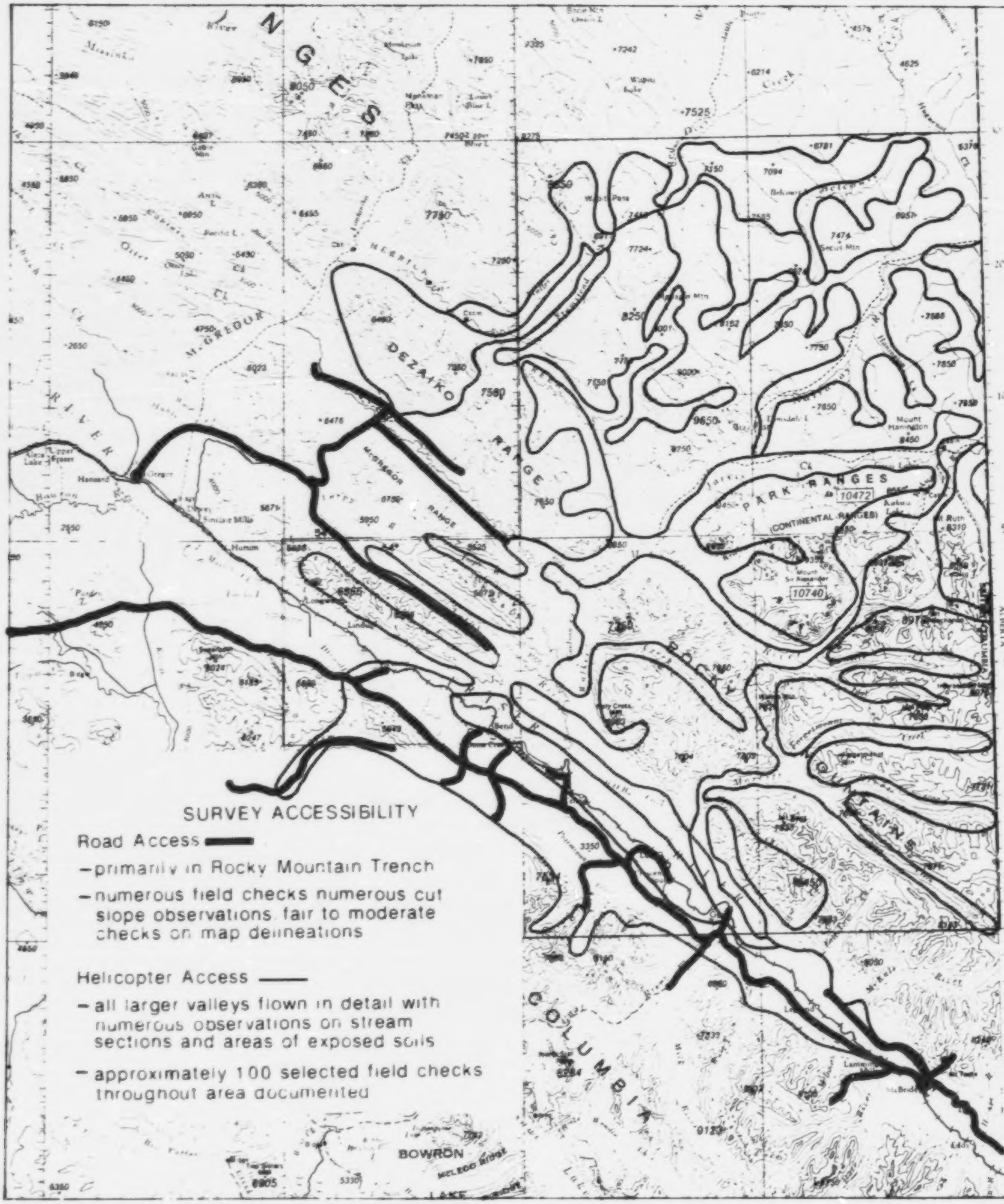
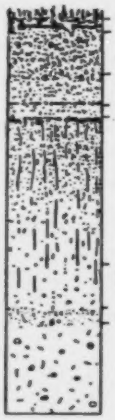

SURVEY ACCESSIBILITY
Road Access
– primarily in Rocky Mountain Trench
– numerous field checks numerous cut slope observations fair to moderate checks on map delineations
Helicopter Access
– all larger valleys flown in detail with numerous observations on stream sections and areas of exposed soils
– approximately 100 selected field checks throughout area documented
DEZAIKO RANGE
McGREGOR RANGE
PARK RANGES
(CONTINENTAL RANGES)
ROCKY MOUNTAINS
COLUMBIA
BOWRON
McGREGOR
RIVER
ALBERTA
54°
50'
40'
30'
20'
10'
10472
10740

Figure 3.1 Survey accessibility.

Mapping reliability depends partially on accessibility and to some extent on landscape complexity. Accessibility was fair to moderate in the Rocky Mountain Trench. Throughout the Rocky Mountains and Rocky Mountain Foothills access was solely by helicopter and mapping was done by aerial photo interpretation. Some representative mountain slopes were selected and transects were walked from the alpine to the valley floor. All major valleys were flown in detail and all possible exposed soil sections (cut banks and erosion scars) were observed particularly along streams and eroded gullies. Pre- typed terrain units were also checked via helicopter transects and selected ground examinations. The relative survey accessibility in the study area is shown in Figure 3.1.

LEGEND FOR SOIL PROFILES

SOIL HORIZONS



L-F-H	Organic horizons
Ah	Mineral horizon of organic matter accumulation
Ae	Horizon of eluviation (leaching)
AB,A&B,BA	Transitional horizons
B	Horizon of Illuviation (accumulation)
BC,CB	Transitional horizons
Ck	Horizon enriched with carbonate
C	Horizon affected little by soil-forming processes

SOIL HORIZON AND CROSS-SECTION PATTERNS

Parent Materials

▨ Morainal ▨ Fluvial ▨ Colluvial ▤ Lacustrine ▨ Organic

Bedrock

▨ Sandstone and shale ▨ Limestone and dolomite ▨ Conglomerate ▨ Metamorphic (e.g. schist)

1. Blank areas indicate solum or topsoil.

SURFICIAL GEOLOGY SYMBOLS*

Genetic Materials

C Colluvial
E Eolian
F Fluvial
L Lacustrine
M Morainal
O Organic
U Undifferentiated
R Bedrock

Surface Expressions

a apron
b blanket (>1m over bedrock)
f fan
h hummocky
l level
m subdued
r ridged
s steep
t terraced
v veneer (<1m over bedrock)

Qualifying Descriptors (superscript)

A active
B bog
F fen
G glacio

Process Modifiers

-A snow avalanching
-C cryoturbation
-N nivation
-P piping
-S solifluction

Texture (general)

f- fine textures (<2mm)
g- gravel
r- rubble
s- sand

Examples:

$F^{G}t$ -fluvioglacial terraced
Cv-C - colluvial veneer undergoing cryoturbation

*For a complete description of the terrain classification system refer to: Terrain Classification, 1976 E.L.U.C. Secretariat, Maps B.C. Parliament Buildings Victoria, B.C.

Figure 3.2 Legend for Graphics in Soil Association Descriptions

3.3 SOIL ASSOCIATION DESCRIPTIONS

The description of each soil association in the section following is accompanied by a diagram showing the physiographic setting of the association and a description of the characteristics of the soil association components, together with some comments on general management implications. Soil profile sketches usually represent the modal soil of the association and thus illustrate the dominant colour, textures, and horizon depths of that particular soil.

The comments for land use are intended to provide a brief general statement on some of the major limitations and capabilities associated with five of the major resource uses.

Comments under ungulates use the landscape usually include climatic and vegetation information as they occur on a particular soil. General comments on forage or browse capability are most often related to moose. The ratings of high, moderate and low capability for browse or forage generally follows the technical paper Forage Capability Classification For British Columbia: A Biophysical Approach, D. A. Demarchi and A. D. Harcombe, 1982. The ratings are based only on ocular estimates of early seral vegetation on some soils. Extrapolations are made to other soils. The major soil criteria used includes texture, available water storage capacity and soil moisture regime in a particular vegetation zone.

More details on the suitability or limitations of the soils for specific uses is given in the appendixes on soil interpretations.

ABBL MOUNTAIN SOIL ASSOCIATION (AB)

Abbl Mountain soils occur in the Rocky Mountains on the west side of the Continental Divide at elevations below 1000 m. They are common in Muller Creek Valley and occur occasionally elsewhere. The soils have developed on gently sloping (2-15%) fluvial fan deposits which are usually not subject to flooding. The materials vary in texture from silt loam to sandy loam; the coarser textures are usually near the fan apex. The parent material originally derived from phyllite schist and other fine-grained bedrock is non-calcareous.

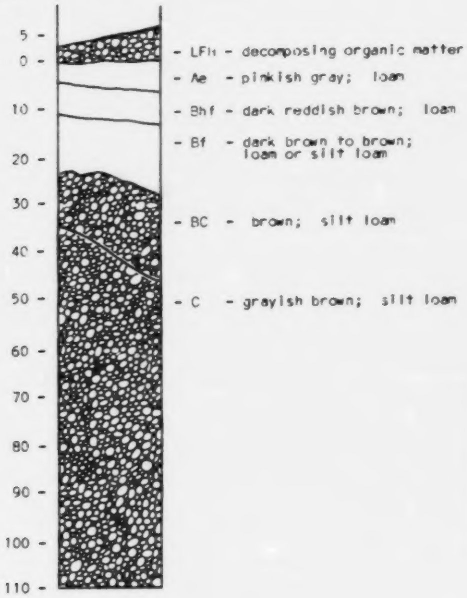
The modal soil development is Orthic Humo-Ferric Podzol. A thin gray leached surface layer is commonly present and is underlain by horizons enriched with iron, aluminum and organic matter (Bf or Bfh). These horizons are usually between 5 and 25 cm in thickness. Only the AB7 component occurs in the survey area.

Associated with the Abbl Mountain soils are McGregor soils which occur on fluvial floodplains, and the Dominion and Barton soils which occur on till and colluvium respectively. Mokus Creek soils occur on more active fluvial fans that are periodically flooded.

Abbl Mountain soils occur in the Subboreal white spruce - alpine fir zone: common paper birch subzone.

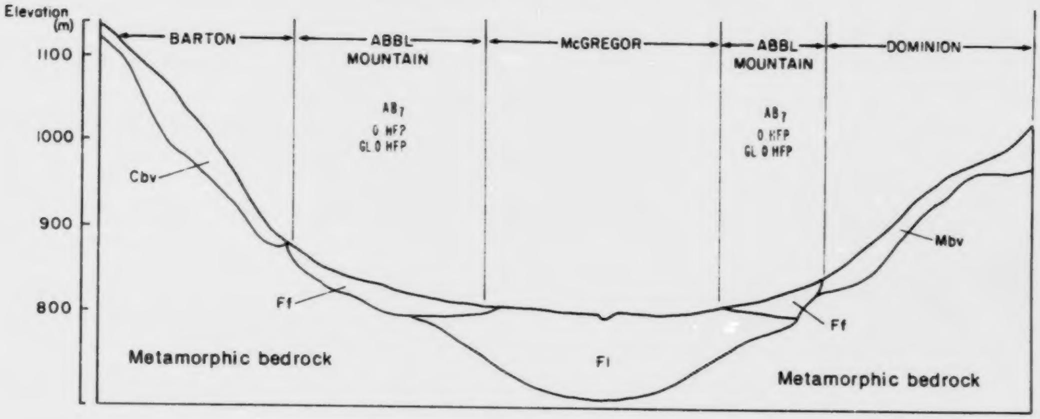
SOIL PROFILE

AB1; Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - pinkish gray; loam
- Bhf - dark reddish brown; loam
- Bf - dark brown to brown; loam or silt loam
- BC - brown; silt loam
- C - grayish brown; silt loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
AB7	Orthic Humo-Ferric Podzol		Moderately Well	>100
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>100

ABBL MOUNTAIN SOIL ASSOCIATION


Elevation (m)
1100
1000
900
800
BARTON
ABBL MOUNTAIN
McGREGOR
ABBL MOUNTAIN
DOMINION
AB7
0 HFP
GL 0 HFP
AB7
0 HFP
GL 0 HFP
Cbv
Ff
Mbv
Ff
Fl
Metamorphic bedrock
Metamorphic bedrock

COMMENTS ON LAND USE

Agriculture. Low to moderate capability. Low moisture-holding capacity on some sites, excess soil moisture on adjacent sites and adverse climate (short frost-free period) are main limitations.

Forestry. Moderate capability. Low temperatures and a short growing season limit forest capability.

Ungulates. Moderate capability for moose. Excessive winter snow depth and the presently mature stage of forest cover are the main limitations. The moist, medium-textured soils have a high capability for browse species production during the early seral stages.

Recreation. High carrying capacity. These soils generally have a high carrying capacity which is limited only slightly by slope and areas subject to seepage.

Engineering. Slight to moderate limitations. Adverse topography, inclusions of wet soils which may cause subgrade instability and potential frost action may be limiting for some engineering uses.

BABETTE SOIL ASSOCIATION (BB)

Babette soils are located along the Continental Divide in the Rocky Mountains at elevations between 1050 and 1800 m. The soils are developed on relatively shallow colluvial materials which are derived from, and generally overlie quartzite and to a lesser extent limestone, dolomite and shale bedrock. The soils are common on the slopes surrounding Babette Lake.

The topography varies from moderately sloping (10-15%) to extremely sloping (46-70%). The soil textures vary widely. The dominant very gravelly loamy sand texture occurs on blocky quartzite slopes. The less common gravelly silt loam occurs on gently sloping areas underlain by mostly siltstone and shale.

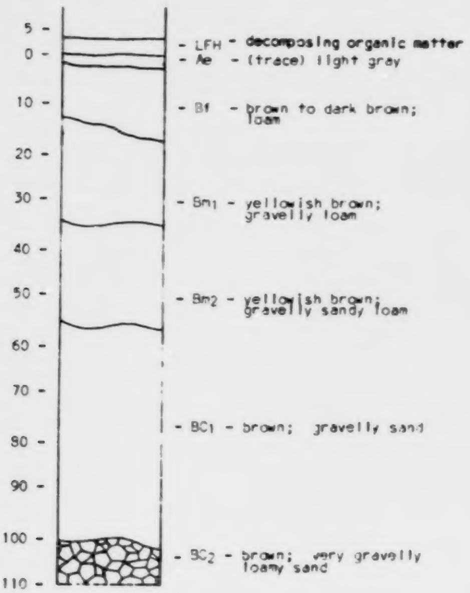
Babette soils often contain a substantial volume of blocky quartzite cobbles, stones and boulders; these rubbly deposits are usually found on shallow soil landscapes at higher elevations and at the base of long colluvial slopes.

The soils vary in reaction depending upon the inclusions of calcareous materials; one representative soil sample showed a pH of 5.4 throughout the control section. The soils are mostly well-drained and are moderately pervious.

The modal soil development is Orthic Humo-Ferric Podzol (component BB1). Soils which occur in upper subalpine meadows and in the krummholz subzone often develop Ah horizons (component BB3). Component BB4 indicates inclusions of soils with Luvisolic development; this component occurs in areas with significant inclusions of interbedded siltstone and shale bedrock. Components BB5 and BB6 are mapped where significant inclusions of lithic soils and dominant inclusions of lithic soils occur respectively. Component BB7 indicates areas where significant drainage restrictions (usually due to underlying bedrock) result in gleyed soils. Component BB11 occurs on slopes which include areas subject to snow avalanching (usually geologically hazardous). This results in restricted soil development. Rock falls are also common.

SOIL PROFILE

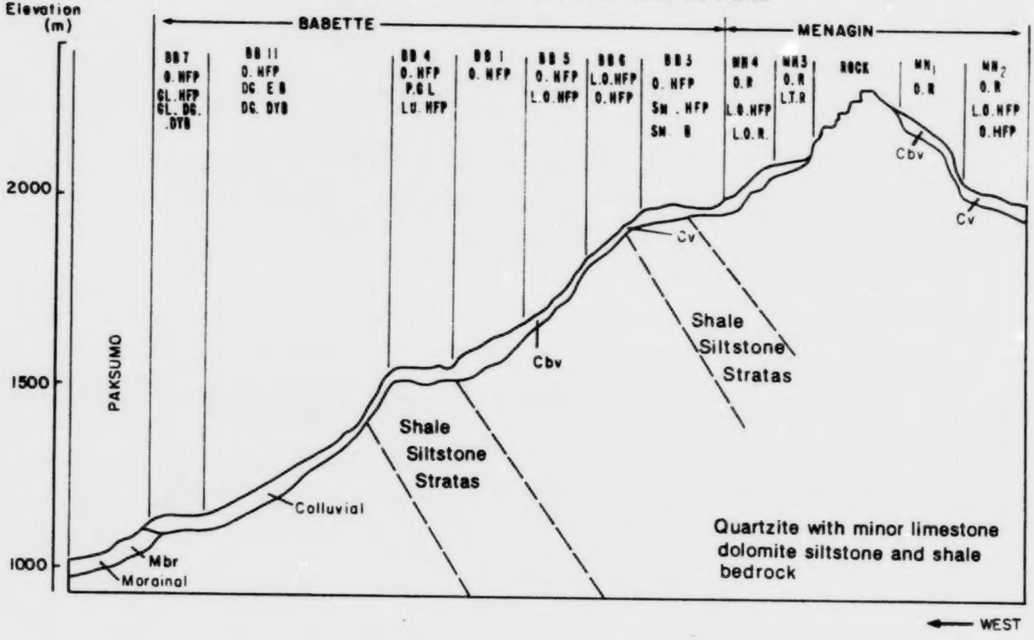
BB1; Orthic Humo-Ferric Podzol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
110 -
- LFH - decomposing organic matter
- Ae - (trace) light gray
- Bf - brown to dark brown; loam
- Bm1 - yellowish brown; gravelly loam
- Bm2 - yellowish brown; gravelly sandy loam
- BC1 - brown; gravelly sand
- BC2 - brown; very gravelly loamy sand

Babette

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BB1	Orthic Humo-Ferric Podzol		well	>50
BB3	Orthic Humo-Ferric Podzol		Moderately well to well	>50
		Sombric Humo-Ferric Podzol	Moderately well to well	>50
		Sombric Brunisol	Moderately well to well	>50
BB4	Orthic Humo-Ferric Podzol		Moderately well to well	>50
		Podzolic Gray Luvisol	Moderately well	>50
		Luvisolic Humo-Ferric Podzol	Moderately well	>50
BB5	Orthic Humo-Ferric Podzol		well to Moderately well	>50
		Lithic Orthic Humo-Ferric Podzol	Moderately well	<50
BB6	Lithic Orthic Humo-Ferric Podzol		well to Rapidly	<50
		Orthic Humo-Ferric Podzol	well	>50
BB7	Orthic Humo-Ferric Podzol		Moderately well	>50
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50
		Gleyed Degraded Dystric Brunisol	Imperfectly	>50
BB11	Orthic Humo-Ferric Podzol		Well	>50
		Degraded Eutric Brunisol	Moderately well	50-100
		Degraded Dystric Brunisol	Moderately well	50-100

BABETTE AND MENAGIN SOIL ASSOCIATIONS


Elevation (m)
2000
1500
1000
PAKSUMO
BABETTE
MENAGIN
BB7
O.HFP
GL.HFP
GL.DG.DYB
BB11
O.HFP
DG.EB
DG.DYB
BB4
O.HFP
P.GL
LU.HFP
BB1
O.HFP
BB5
O.HFP
L.O.HFP
BB6
L.O.HFP
O.HFP
BB3
O.HFP
SM.HFP
SM.B
MN4
O.R
L.O.HFP
L.O.R.
MN3
O.R
LT.R
ROCK
MN1
O.R
MN2
O.R
L.O.HFP
O.HFP
Cbv
Cv
Cv
Cbv
Shale
Siltstone
Stratas
Shale
Siltstone
Stratas
Colluvial
Mbr
Morainal
Quartzite with minor limestone dolomite siltstone and shale bedrock
WEST

Babette soils are often mapped in complexes with the Paksumo Soil Association which is derived from till.

This association occurs mostly in the Subalpine Engelmann spruce - alpine fir forest zone of the Subboreal Region. Lesser areas also occur in some of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse subalpine climate, steep slopes and excessive stoniness preclude agricultural use.
Forestry.	Low capability. A short growing season, excessive snow depth and shallow, very cold soils are the main limitations to forest growth.
Ungulates.	Low capability for moose, goat, and caribou. Excessive winter snow depths, excessive slopes and the present mature stage of forest cover limits use. Babette soils have a wide variety of moisture regimes. Components BB7 and BB11 should have a high browse production capability during the early seral stages.
Recreation.	Moderate to very low carrying capacity. Steep slopes, excessive coarse fragments and the incidence of avalanche slopes are the main limiting factors.
Engineering.	Severe limitations. Steep slopes, the incidence of near surface bedrock, avalanche zones and potential frost action are the main limitations for use.

BARTON SOIL ASSOCIATION (BT)

Barton soils occur in the Rocky Mountains on the west side of the Continental Divide. They are located primarily in the Herrick Valley on steep (>30%) colluvial slopes, below 1000 m elevation. Generally, the soils are developed in relatively shallow colluvium which is derived from and overlies non-calcareous, fine-grained metamorphic bedrock.

The soil texture is gravelly loam or gravelly silt loam. The soils are generally well drained, moderately pervious and many areas transmit and receive seepage.

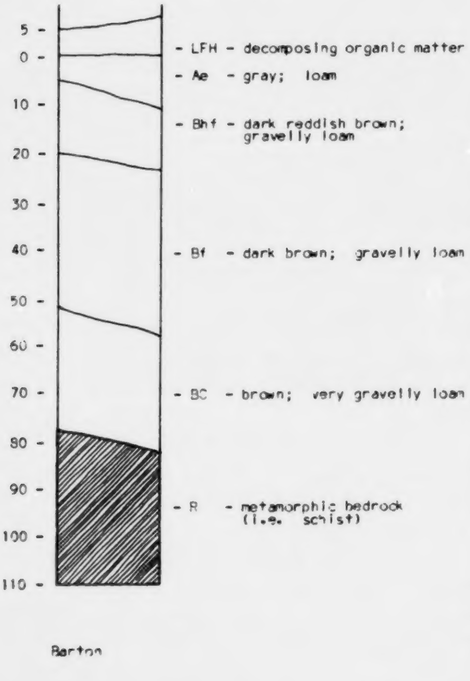
The modal soil has Orthic Ferro-Humic Podzol development as indicated by component BT1. Podzolic soil horizons in this component are characterized by organic matter, iron, and aluminum accumulation which is frequently up to 50 cm thick. The BT2 component consists of soils with less humus accumulation in the B horizon, thus they are dominantly Orthic Humo-Ferric Podzols. BT5 contains minor proportions of lithic soils with a bedrock contact at less than 50 cm from the surface. The BT11 component includes soils which are subject to snow avalanche activity.

Barton soils are similar to Dezaiko soils, however the Dezaiko association is located in the Subalpine Engelmann spruce alpine fir zone. Other soils associated with the Barton association include the Dominion, Bowron, McGregor and Abbi Mountain soil associations.

Barton soils occur within the Subboreal white spruce - alpine fir zone: common paper birch subzone.

SOIL PROFILE

BT1; Orthic Ferro-Humic Podzol


5
0
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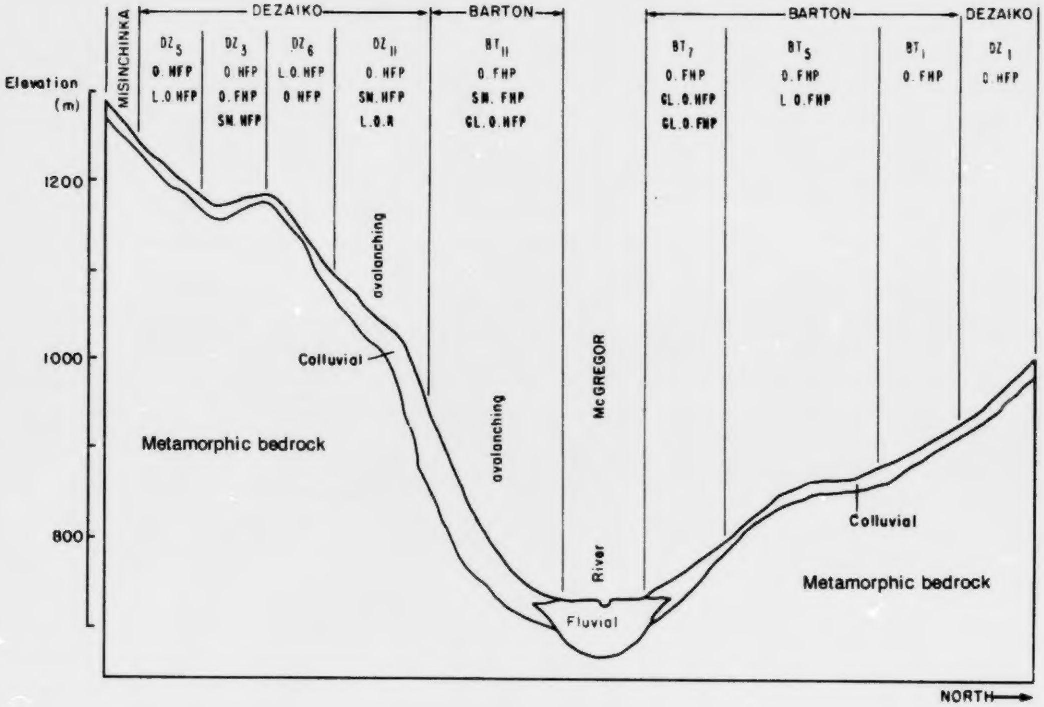
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - gray; loam
- Bhf - dark reddish brown; gravelly loam
- Bf - dark brown; gravelly loam
- BC - brown; very gravelly loam
- R - metamorphic bedrock (i.e. schist)

Barton

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BT1	Orthic Ferro-Humic Podzol		Well	>50
BT2	Orthic Ferro-Humic Podzol		Well	>50
		Orthic Humo-Ferric Podzol	Well	>50
BT5	Orthic Ferro-Humic Podzol		Well	>50
		Lithic Orthic Ferro-Humic Podzol	Well	<50
		Lithic Orthic Humo-Ferric Podzol	Well	>50
BT7	Orthic Ferro-Humic Podzol		Well	<50
		Gleyed Orthic Ferro-Humic Podzol	Imperfectly	>50
BT11*	Orthic Ferro-Humic Podzol		Well	>50
		Sombric Ferro-Humic Podzol	Well	>50
		Gleyed Orthic Ferro-Humic Podzol	Imperfectly	>50

BT11* Prone to snow avalanching

BARTON AND DEZAIKO SOIL ASSOCIATIONS


MISINCHINKA
DEZAIKO
BARTON
BARTON
DEZAIKO
DZ_5 O. HFP L.O.HFP
DZ_3 O. HFP O. FHP SN. HFP
DZ_6 L.O. HFP O HFP
DZ_{11} O. HFP SN. HFP L.O.R
BT_{11} O. FHP SN. FHP GL.O.HFP
BT_7 O. FHP GL.O.HFP GL.O.FHP
BT_5 O. FHP L O.FHP
BT_1 O. FHP
DZ_1 O. HFP
Elevation (m)
1200
1000
800
avalanching
Colluvial
Metamorphic bedrock
avalanching
McGREGOR
River
Fluvial
Colluvial
Metamorphic bedrock
NORTH

COMMENTS ON LAND USE

Agriculture.	Very low capability. Steep topography, stoniness and adverse climate preclude agricultural use.
Forestry.	Moderate capability. A short growing season and low soil temperatures pose the main limitations to forest growth.
Ungulates.	Low capability for moose. The current mature stage of forest succession is a major limitation. Excessive winter snow depths limit other ungulates. The soils have a moderate to high capability for browse production during the early seral stages.
Recreation.	Low to very low carrying capacity. Steep slopes and areas prone to seepage are the major limitations.
Engineering.	Severe limitations. Steep slopes and seepage zones limit engineering suitability.

BASTILLE SOIL ASSOCIATION (BS)

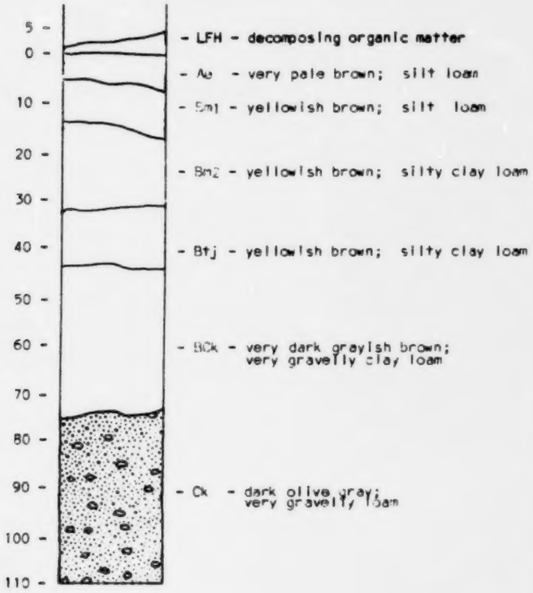
Bastille soils are located in the Rocky Mountains and in portions of the Rocky Mountain Foothills between 1050 and 1800 m asl. The soils are developed on calcareous till derived from and generally overlying limestone, dolomite, shale and quartzite bedrock. The soils occur along the Continental Divide from Bastille Creek to Belcourt Creek.

Bastille soils occur in two general landscape locations. The first in a moderately sloping (10-15%) valley floor position which consists of deep moderately compact till, and the second is a strong to extremely sloping (15-50%) middle to upper slope position, which consists of a shallower, less compact till with a loose, modified surface due to some colluvial action.

Soil textures range from very gravelly loam to gravelly clay loam with the coarser textures varying both in geographical extent as well as through depth. The variable textures are due to both weathering and modification by slope processes. The soils are well to moderately well drained and are moderately pervious. They have medium runoff, and moderate to high moisture holding capacity. Below 50 cm depth the soils are extremely calcareous; at this depth there is generally an increase in clay content.

SOIL PROFILE

BS_4; Degraded Eutric Brunisol


5
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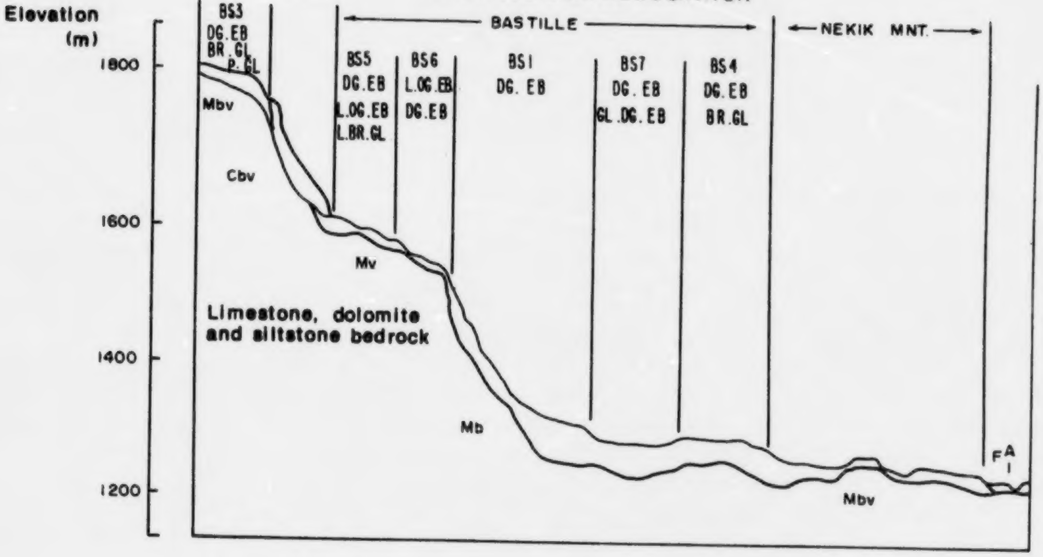
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - very pale brown; silt loam
- Bm1 - yellowish brown; silt loam
- Bm2 - yellowish brown; silty clay loam
- Btj - yellowish brown; silty clay loam
- BCk - very dark grayish brown; very gravelly clay loam
- Ck - dark olive gray; very gravelly loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BS1	Degraded Eutric Brunisol		Well to Moderately Well	>50
BS3	Degraded Eutric Brunisol		Well	>50
		Brunisolic Gray Luvisol	Moderately Well	>50
		Podzolic Gray Luvisol	Moderately Well	>50
BS4	Degraded Eutric Brunisol		Well	>50
		Brunisolic Gray Luvisol	Moderately Well	>50
BS5	Degraded Eutric Brunisol		Well to Moderately Well	10-100
		Lithic Degraded Eutric Brunisol	Well to Moderately Well	<50
		cLithic Brunisoli Gray Luvisol	Well to Moderately Well	<50
BS6	Lithic Degraded Eutric Brunisol		Well to Moderately Well	<50
		Degraded Eutric Brunisol	Well to Moderately Well	10-100
BS7	Degraded Eutric Brunisol		Moderately Well	>50
		Gleyed Degraded Eutric Brunisol	Imperfectly	>50

BASTILLE SOIL ASSOCIATION



The modal soil is Degraded Eutric Brunisol (component BS1); this relatively weak soil development is due to the fine textured calcareous nature of the parent material and the decreased precipitation near the Continental Divide. The BS3 component indicates Brunisolic Gray Luvisol and Podzolic Gray Luvisol development which occurs at higher and climatically wetter elevations. This component borders the krummholz tree island subzone. Component BS4 is mapped on the valley floors which are mantled with somewhat finer textured basal till that promotes luvisolic soil development. Component BS5 indicates soils with inclusions of bedrock, to within 10 to 50 cm of the soil surface. The BS6 component indicates soils which are dominantly shallow to bedrock. Areas subject to seepage and which are periodically or seasonally saturated are included in component BS7.

Bastille soils are similar in most characteristics to the Onion Creek soil association except that the zone of clay accumulation is more weakly expressed in the Bastille soil association.

Bastille soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and topography are major limitations and preclude agricultural use.
Forestry.	Low capability. A short growing season and very cold, dense, massive subsoils strongly limit forest growth.
Ungulates.	Low capability for moose. Excessive snow depth during winter and the present mature stage of forest cover limit use. The deep, medium textured soils particularly components BB1, BB4 and BB7, have a relatively high browse production capability during early stages.
Recreation.	Slight to moderate limitations. Topography and inclusions of wet imperfectly drained soils are the main limitations.
Engineering.	Moderate limitations. Frost action and steep slopes pose the main limitations.

BEAUREGARD MOUNTAIN SOIL ASSOCIATION (BG)

Beauregard Mountain soils occur in the Rocky Mountains between 1050 and 1650 m elevation, usually on the west side of the Continental Divide. These soils have developed on moderately to strongly (5 to 30%) sloping morainal deposits which usually overlie fine-grained metamorphic bedrock. The texture of the parent material varies from silt loam to sandy loam, with 10 to 40% coarse fragment content. Beauregard Mountain soils occur in small isolated areas only; in this report area they occur on the slopes above Muller and Framstead creeks.

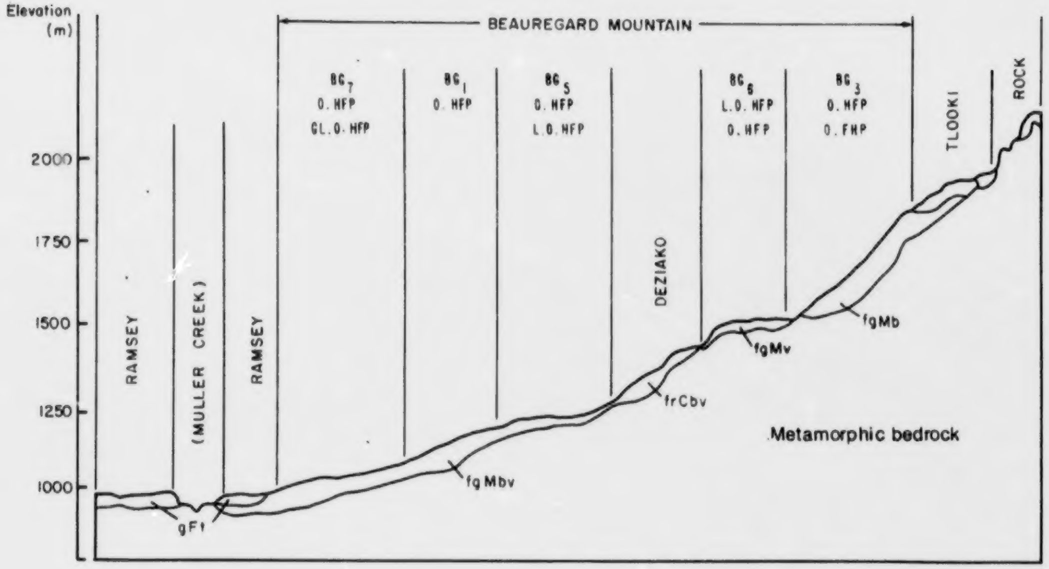
Modal soil development is Orthic Humo-Ferric Podzol (component BG1). The BG3 component occurs at higher elevations in the krummholz subzone. Component BG5 has significant inclusions of lithic soils, while BG6 dominantly consists of lithic soils. Soils which receive seepage causing mottling and gleying are included in component BG7.

Beauregard Mountain soils differ from Turning Mountain soils in that they are finer textured and are derived from metamorphic bedrock. The Dezaiko soil association which consists of soils developed in colluvium is often mapped in association with Beauregard Mountain soils.

Beauregard Mountain soils occur within the Subalpine Engelmann spruce - alpine fir forest zone of the Subboreal region.

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BG1	Orthic Humo-Ferric Podzol		Well	>50
BG3	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Orthic Ferro-Humic Podzol	Moderately Well	>50
BG5	Orthic Humo-Ferric Podzol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
BG6	Lithic Orthic Humo-Ferric Podzol		Well to Moderately Well	<50
		Orthic Humo-Ferric Podzol	Well	>50
BG7	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50

BEAUREGARD MOUNTAIN SOIL ASSOCIATION


Elevation (m)
2000
1750
1500
1250
1000
BEAUREGARD MOUNTAIN
RAMSEY
(MULLER CREEK)
RAMSEY
BG7
O.HFP
GL.O.HFP
BG1
O.HFP
BG5
O.HFP
L.O.HFP
DEZIAKO
BG6
L.O.HFP
O.HFP
BG3
O.HFP
O.FHP
TLOOKI
ROCK
gFt
fgMbv
frCbv
fgMv
fgMb
Metamorphic bedrock

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and topography are major limitations.
Forestry.	Low capability. A short growing season, very cold soils and deep snow pack limit tree growth.
Ungulates.	Low to moderate capability for moose and caribou. Deep winter snow and the present mature stage of forest cover are the main limitations. The deeper and moister soil components such as BG7 and to some extent BG1 have a relatively high capability for browse production during early seral stages.
Recreation.	High to moderate carrying capacity. Adverse slope and areas subject to seepage are the main limitations.
Engineering.	Moderate to severe limitations. The degree of limitation depends on the steepness of slope and the nature and volume of seepage.

BECKER MOUNTAIN SOIL ASSOCIATION (BC)*

Becker Mountain soils occur in the Rocky Mountains on very strongly to steeply sloping terrain (30-100%), at elevations between 1050 and 1900 m asl. They have developed on rubbly talus material derived primarily from limestone and dolomite bedrock, but which may also include quartzite, siltstone, and mudstone rock fragments. The texture is primarily blocky or rubbly with 50 to 100% coarse fragment content; the finer soil matrix is very small by volume and ranges from sand to silt loam in texture.

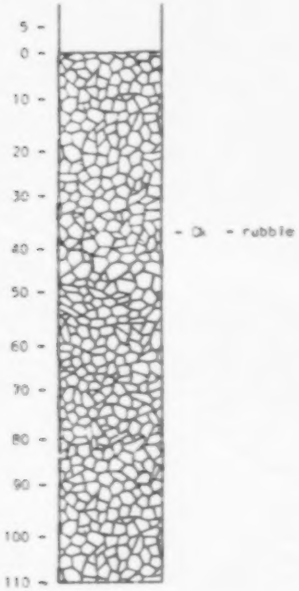
Becker Mountain soils are often prone to rock fall and snow avalanching. The soils are common throughout the Mount Sir Alexander area where they occur consistently along the base of cirque walls.

Active downslope movement severely inhibits the development of any A or B soil horizons, thus the modal soil is Orthic Regosol (Component BC1). Component BC5 contain significant amounts of lithic soils with bedrock contact at less than 50 cm depth, while BC6 is mostly lithic. A weak Bm horizon occasionally develops on the relatively more stable areas of the BC5 component, resulting in soils with Lithic Orthic Eutric Brunisol soil development.

Becker Mountain and Tlooki soils differ in terms of the bedrock lithology. The latter consists mostly of colluvium derived from mixed metamorphic and sedimentary rock.

SOIL PROFILE

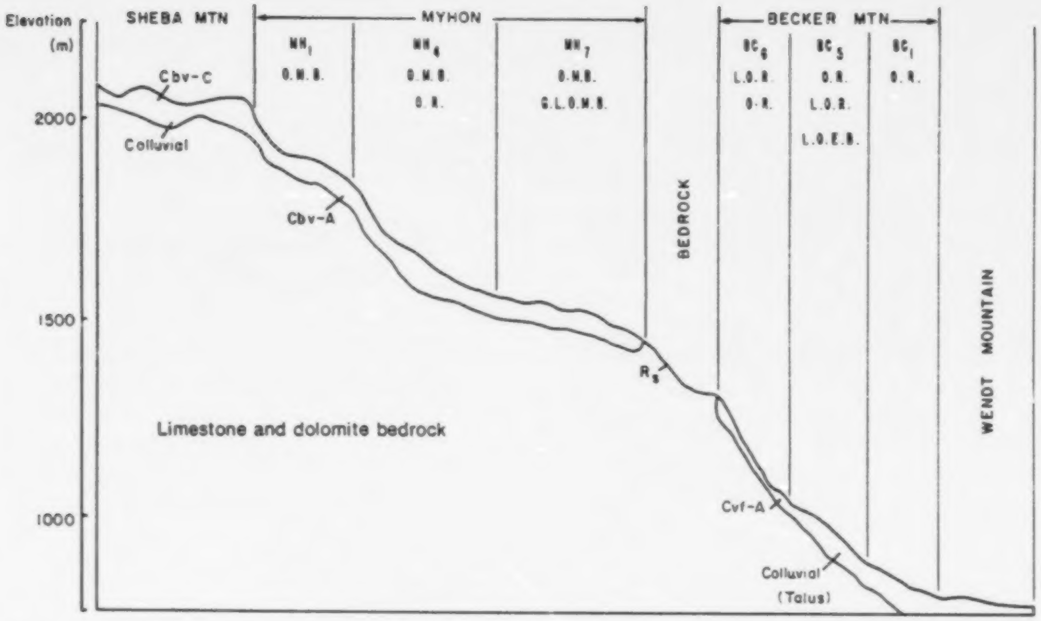
BC_1: Orthic Regosol



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BC1	Orthic Regosol		Rapidly Drained	>50
BC5	Orthic Regosol		Rapidly Drained	>50
		Lithic Orthic Regosol	Rapidly Drained	<50
		Lithic Orthic Eutric Brunisol	Rapidly Drained	<50
BC6	Lithic Orthic Regosol		Rapidly Drained	<50
		Orthic Regosol	Rapidly Drained	>50

Becker Mt.

MYHON AND BECKER MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
2000
1500
1000
SHEBA MTN
MYHON
BECKER MTN
MH_1
O.M.B.
MH_4
O.M.B.
O.R.
MH_7
O.M.B.
G.L.O.M.B.
BEDROCK
BC_6
L.O.R.
O.R.
BC_5
O.R.
L.O.R.
L.O.E.B.
BC_1
O.R.
WENOT MOUNTAIN
Cbv-C
Colluvial
Cbv-A
R_s
Limestone and dolomite bedrock
Cvf-A
Colluvial (Talus)

Becker Mountain soils typically have few, if any, trees present. Little vegetation grows on active talus slopes, however in some locations relatively less active talus has become vegetated.

This association occurs in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region and to a minor extent in the Interior Wet Belt Regions.

*Refer to Myhon association for cross-sectional diagram.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse climate, steep topography, and excessive stoniness preclude agricultural uses.
Forestry.	Very low capability. The active talus slopes severely inhibit the establishment of trees. Excessive stoniness and the shallow depth to bedrock are also limitations.
Ungulates.	Low capability for goats. Very low forage production due to the droughty, rubbly soils limits use by other ungulates.
Recreation.	Low to very low carrying capacity. Steep slopes, coarse, rubbly texture and erosion potential all limit the carrying capacity.
Engineering.	Severe limitations. Actively eroding steep slopes and shallowness to bedrock severely limit most engineering uses.

BEDROCK MAP UNITS (RK)

The bedrock of the study area has been grouped into five categories for soil mapping purposes. Chapter 2.3 provides a regional description of the various lithologies.

Within the Rocky Mountain Foothills region, component RK1 has been used most extensively and identifies fine to medium grained sandstone, siltstone, mudstone, shale and coal. RK3 also occurring in this region, identifies minor occurances of conglomerate.

The Rocky Mountain region consists largely of limestone, dolomite, sandstone and shale; these dominantly calcareous rocks are identified by component RK2. In the vacinity of the Continental Divide a belt of dominating quartzite is mapped by component RK5.

The Park Range, within the Rocky Mountain region, as well as minor portions of the McGregor Plateau, Rocky Mountain Trench and Cariboo Mountain regions consist of various bedrock stratas, dominated by fine to coarse grained metamorphic rock. This group (component RK4) is largely acidic with inclusions of calcareous limestone and shales.

BLUE LAKE SOIL ASSOCIATION (BE)

The Blue Lake Soil Association occurs in the Rocky Mountains on moderate to extreme (15-60%+) colluvial slopes, usually on the east side of the Continental Divide. A representative area is the east facing slopes located west of Neklk Mountain. The elevation range is from 1050 to 1900 m asl. The texture of the colluvium ranges from silty clay loam to silty clay, with 10 to 40% coarse fragment content. The materials, derived from siltstone with inclusions of limestone and shales, are usually shallow and overlie siltstone bedrock.

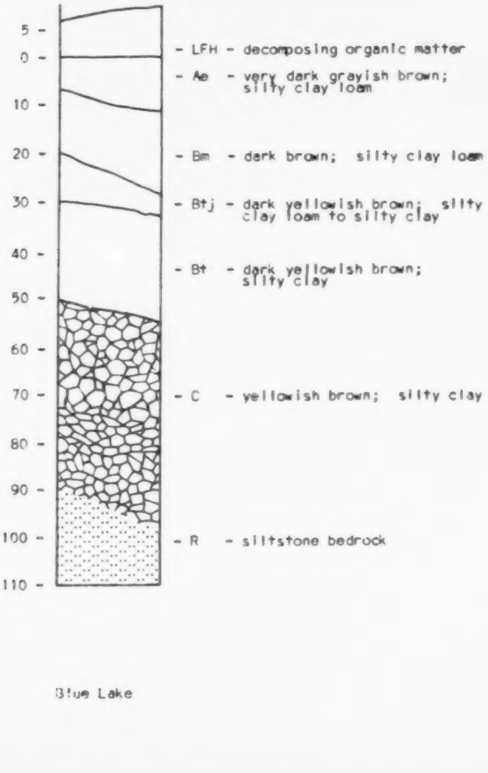
The modal soil in this association is a Brunisolic Gray Luvisol. All soils have a horizon of clay accumulation (Bt) between 30 and 60 cm in depth. Areas with bedrock contact to within 50 cm of the surface are included as a minor in the BE5 component. The BE3 soils, with Podzolic Gray Luvisol inclusions, occur in higher elevations where a Bf horizon has developed. The BE7 soils are gleyed and usually receive or transmit seepage water.

Blue Lake soils are frequently mapped with the Myhon, Hedrick and Onion Creek soil associations. Imperial Creek soils are often mapped downslope of Blue Lake soils as they also overlie siltstone bedrock.

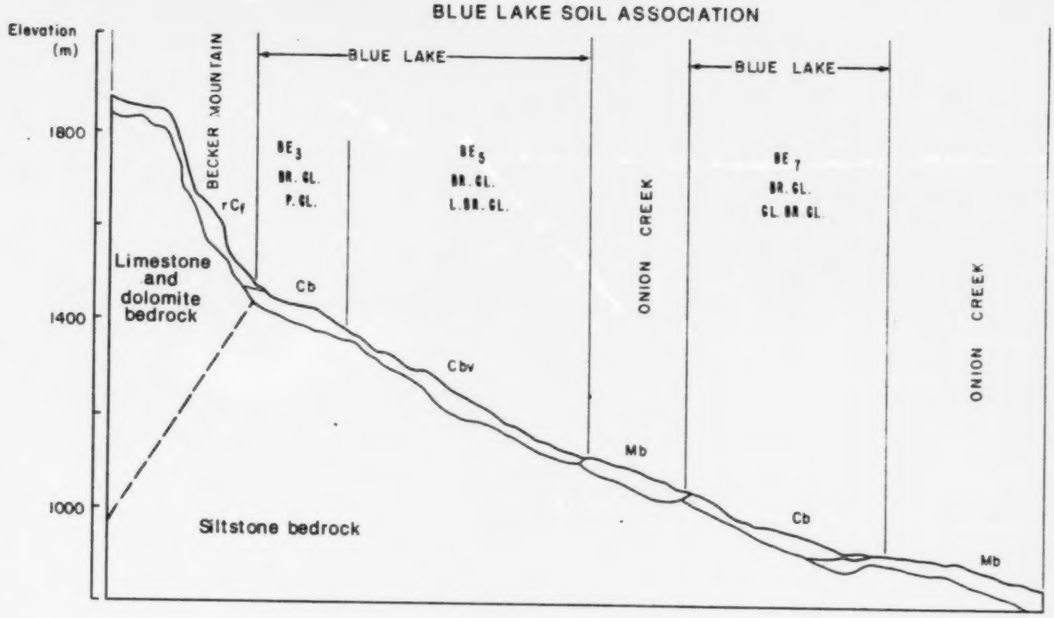
Blue Lake soils occur within the Subalpine Engelmann spruce - alpine fir zone. Engelmann spruce, alpine fir, and lodgepole pine are the dominant trees; white rhododendron, vaccinium and alder are some of the common shrubs.

SOIL PROFILE

BE1; Brunisolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - very dark grayish brown; silty clay loam
- Bm - dark brown; silty clay loam
- Btj - dark yellowish brown; silty clay loam to silty clay
- Bt - dark yellowish brown; silty clay
- C - yellowish brown; silty clay
- R - siltstone bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BE3	Brunisolic Gray Luvisol		Well	>50
		Podzolic Gray Luvisol	Well	>50
BE5	Brunisolic Gray Luvisol		Well	>50
		Lithic Brunisolic Gray Luvisol	Well	<50
BE7	Brunisolic Gray Luvisol		Well	>50
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>50


BLUE LAKE SOIL ASSOCIATION
Elevation (m)
1800
1400
1000
BECKER MOUNTAIN
BLUE LAKE
BLUE LAKE
ONION CREEK
ONION CREEK
BE$_3$
BR. GL.
P. GL.
BE$_5$
BR. GL.
L. BR. GL.
BE$_7$
BR. GL.
GL. BR. GL.
rC$_f$
Cb
Cbv
Mb
Cb
Mb
Limestone and dolomite bedrock
Siltstone bedrock

COMMENTS ON LAND USE

Agriculture. Very low capability. Adverse subalpine climate and steep slopes are the major limitations for agriculture.

Forestry. Low capability. A short growing season limits forest growth.

Ungulates. Low capability for moose, goat, and caribou. Excessive snow depths and the present mature forest cover are the main limitations. Areas of deep, moist soils such as component BE7 has a relatively higher browse production capability during early seral stages.

Recreation. Moderate to very low carrying capacity. Steep slopes and susceptibility to compaction and erosion are main limiting factors.

Engineering. Severe limitations. Steep slopes, the poor suitability of siltstone derived materials for subgrade, and potential frost action are some of the main limitations for use.

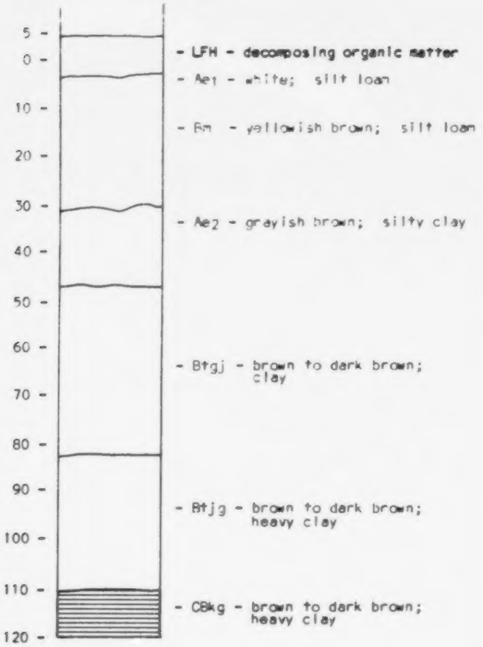
BOWES CREEK SOIL ASSOCIATION (BW)

Bowes Creek soils occur on the McGregor Plateau and to a lesser extent in the Rocky Mountains at elevations between 700 and 1000 m. They have developed in deep, clayey lacustrine sediments which occupy the floors of the Torpy, Morkill and McGregor river valleys and Goodson and Jarvis creek valleys. The streams are usually well entrenched in the lacustrine sediments and have silty to sandy fluvial terrace deposits along their margins which are usually mapped as Guilford soils.

In the McGregor and Jarvis valleys, small streams emanating from adjacent mountain walls have eroded the lacustrine surface to creat extensive gully networks; in other areas the deposits may be relatively level. Bowes Creek soils therefore occur on a variety of topography, ranging from very gently sloping terraces with 2 to 5% slopes to extremely gullied terrain with slopes between 46 and 70%. The soils are slowly permeable and are generally moist throughout the growing season. They are very suspectible to puddling and erosion; they usually require extensive drainage ditches when used for main roads.

SOIL PROFILE

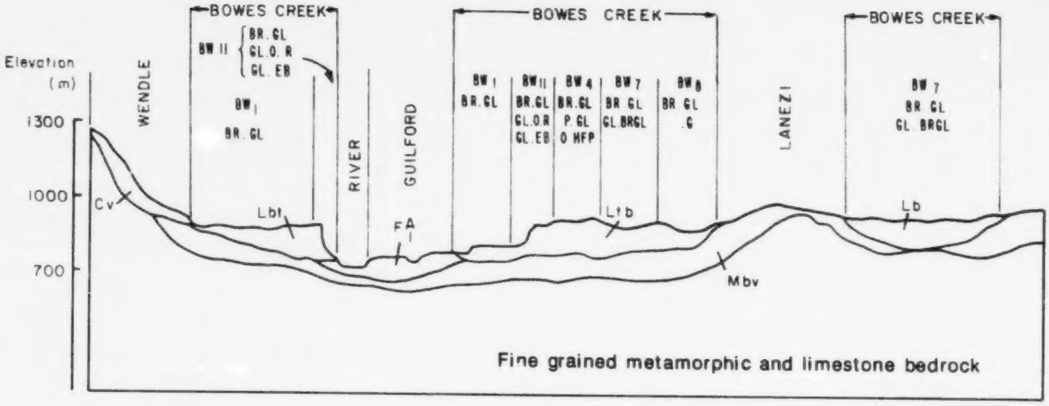
BW1: Brunisolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
- LFH - decomposing organic matter
- Ae_1 - white; silt loan
- Bm - yellowish brown; silt loan
- Ae_2 - grayish brown; silty clay
- Btgj - brown to dark brown; clay
- Btjg - brown to dark brown; heavy clay
- CBkg - brown to dark brown; heavy clay

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
BW1	Brunisolic Gray Luvisol		Moderately Well	>100
BW4	Brunisolic Gray Luvisol		Moderately Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
		Orthic Humo-Ferric Podzol	Well	>100
BW7	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>100
BW8	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleysolic	Poorly	>100
BW11*	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleyed Orthic Regosol	Imperfectly	>100
		Gleyed Eutric Brunisol	Imperfectly	>100

*BW11 mapped in areas with active slumps and failures.

BOWES CREEK SOIL ASSOCIATION



Bowes Creek soil development is dominantly Brunisolic Gray Luvisol (component BW1). The texture of the upper 20 to 50 cm is usually silt loam or silty clay loam. A significant increase in clay content occurs below this depth (textures change to silty clay or clay) which is due both to the depositional nature of the sediments and soil weathering processes which has caused clay accumulation in the lower solum. Those areas with slightly coarser surface textures and associated Podzolic soil development, commonly found at slightly higher elevations, are included in the BW4 component. The BW7 component includes soils that are periodically saturated, and show gleying and mottling. These gleyed soils are common due to the high precipitation and the relatively impermeable silty clay to clay subsoil which leads to temporarily perched water tables. The BW8 component contains significant areas of Gleysolic soils which are subject to prolonged saturation and poor drainage. The Gleysolic soils often have peaty surfaces. The BW11 component identifies soils which occur on steep escarpments and are subject to active slumping and failure due to stream undercutting, saturated soil conditions and freeze-thaw action. This component identifies hazardous soil conditions.

Bowes Creek soils occur in both the Interior western hemlock - western red cedar zone and the Interior western red cedar-white spruce zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Low to moderate capability. An adverse climate, cool dense massive subsoils, and adverse topography are the main limitations.
Forestry.	Moderate capability. A short, cool growing season and dense, cool soils are the major limitations.
Ungulates.	Moderate capability for moose. Excessive snow depth is a severe limitation for other ungulates. The deep, medium to fine textured, moist soils have a relatively high capability for browse production during the early seral stages.
Recreation.	Low carrying capacity. Fine textures and commonly saturated soils, create conditions suitable for compaction and puddling - this condition in turn creates a high erosion potential.
Engineering.	Moderate to severe limitations. High clay contents coupled with usually moist conditions provide poor subgrade material. Potential frost action is also a limiting factor. The soils are very sensitive to excess soil moisture, consequently trafficability, excavation and associated erosion problems emerge quickly.

BOWRON SOIL ASSOCIATION (BO)

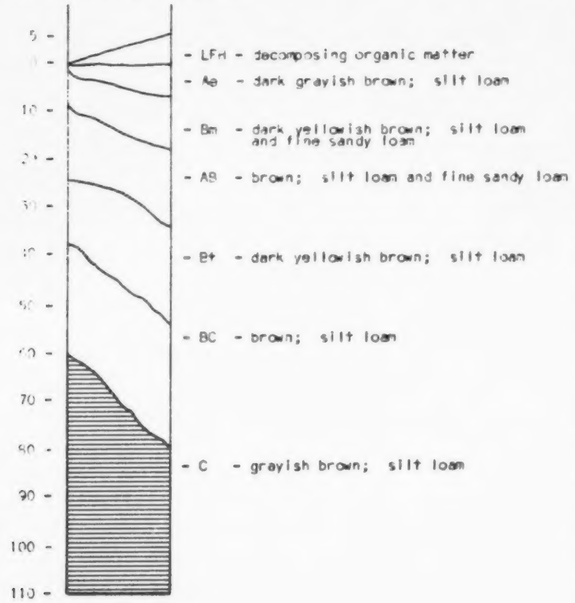
Bowron soils are located in the Rocky Mountains at elevations of less than 1070 m. They have developed in deep silty lacustrine sediments that lie across the valley floors of the Herrick, Framstead, Muller, Spakwaniko and Fontaniko creeks. The materials are characterized by extensive gully networks cut into very gently sloping terraces. Many of the gullies are over 60 m deep and 100 m across and the slopes on the gullies are very steep to extreme (46 to >100%). Small drainages at the bottom of the gullies frequently flow on bedrock. During spring freshets these streams often undercut the saturated gully walls causing numerous slope failures.

The dominant texture of the Bowron sediments is silt loam with common inclusions of silty clay loam. The texture of this association consists of more silt and fine sands than the Bowes Creek lacustrine association, which is mapped on the west side of the Dezaiko Range along the McGregor River.

Bowron soils have high moisture holding capacity and are prone to slope failure, gullying and piping. Areas exhibiting these erosional features are particularly hazardous.

Generally, the soils are moderately well to imperfectly drained and most areas remain moist throughout the year. Bowron soils have strongly acid surface horizons and are usually calcareous at depth (1 m).

SOIL PROFILE
B01: Brunisolic Gray Luvisol

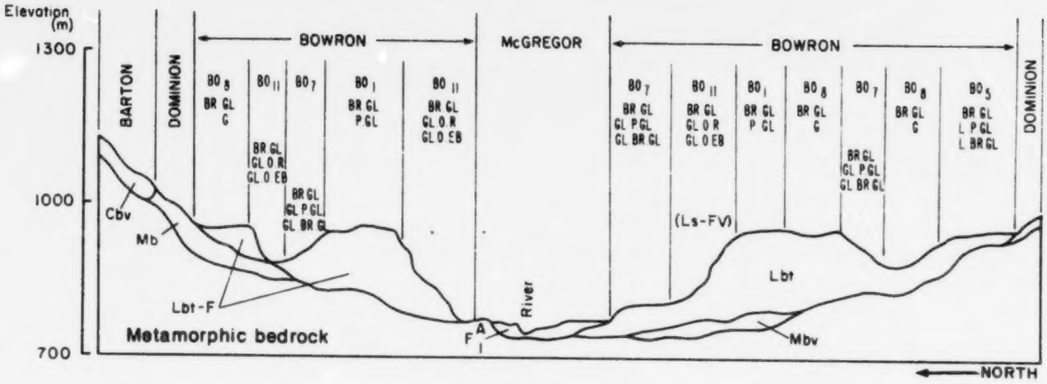

5
0
10
20
30
40
50
60
70
80
90
100
110
LFH - decomposing organic matter
Ae - dark grayish brown; silt loam
Bm - dark yellowish brown; silt loam and fine sandy loam
AB - brown; silt loam and fine sandy loam
Bt - dark yellowish brown; silt loam
BC - brown; silt loam
C - grayish brown; silt loam

Bowron

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
B01	Brunisolic Gray Luvisol	Podzolic Gray Luvisol	Moderately Well	>100
B05	Brunisolic Gray Luvisol		Moderately Well	>100
		Lithic Podzolic Gray Luvisol	Moderately Well	10-100
		Lithic Brunisolic Gray Luvisol	Moderately Well	10-100
B07	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleyed Podzolic Gray Luvisol	Imperfectly	>100
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>100
B08	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleysolic	Poorly	>100
B011*	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleyed Orthic Regosol	Imperfectly	>100
		Gleyed Orthic Eutric Brunisol	Imperfectly	>100

*Mapped in areas with active slumps and failures.

BOWRON SOIL ASSOCIATION


Elevation (m)
1300
1000
700
BARTON
DOMINION
BOWRON
BO8
BR GL
G
BO11
BR GL
GL O R
GL O EB
BO7
BR GL
GL P GL
GL BR GL
BO1
BR GL
P GL
BO11
BR GL
GL O R
GL O EB
McGREGOR
BOWRON
BO7
BR GL
GL P GL
GL BR GL
BO11
BR GL
GL O R
GL O EB
BO1
BR GL
P GL
BO8
BR GL
G
BO7
BR GL
GL P GL
GL BR GL
BO8
BR GL
G
BO5
BR GL
L P GL
L BR GL
DOMINION
Cbv
Mb
Lbt-F
Metamorphic bedrock
F
A
I
River
(Ls-FV)
Lbt
Mbv
NORTH

The modal soil development includes both Brunisolic Gray Luvisol and Podzolic Gray Luvisol development as indicated by the BO1 component. The classification depends on the depth to the clay accumulation horizon in the subsoil - which varies across this landscape. The BO5 component indicates common inclusions of lithic soils. The BO7 component identifies soils subject to seepage and periodic saturation as indicated by gleying and mottling. There are extensive areas of BO7 soils. Soils subject to permanently saturated conditions due to their proximity to floodplains and organic deposits, are indicated with the component BO8. The BO11 component includes steep eroding escarpments and silty colluvial fans. Soils on these sites are often young and lack development. This component indicates hazardous areas subject to active slumping and failures.

The Bowron association in this report is generally located at higher elevations and in a relatively cooler climate than the Bowron soils mapped and described in the Prince George and Barkerville soil survey areas. However, the general chemical and physical characteristics - given the variable nature of lacustrine deposits in mountain valleys - are generally comparable.

Bowron soils are located in the Subboreal white spruce - alpine fir zone: common paper birch subzone.

COMMENTS ON LAND USE

Agriculture.	Low capability. The cold subboreal climate in the valleys of Rocky Mountains, coupled with the steep topography strongly limits agricultural capability.
Forestry.	Moderate capability for white spruce. Climate and massive subsoil structure pose limits to tree growth.
Ungulates.	Moderate capability for moose. Use depends upon snow depths and the seral condition of the forest. The deep, moist, medium-textured soils have a relatively high capability for browse production during early seral stages.
Recreation.	Severe to moderate limitation. Capability varies strongly with topography and soil moisture conditions.
Engineering.	Severe to moderate limitations. High erosion potential, steep slopes, frost action, and the potential for unstable subgrade conditions due to variable soil moisture conditions, pose the major limitations to use.

CATFISH CREEK SOIL ASSOCIATION (CC)

Catfish Creek soils occur mainly on the floor of the Rocky Mountain Trench and, to a lesser extent, in the valleys of the Morkill, Torpy and McGregor Rivers. Elevational range is from 730 to about 1440 m. These soils have developed in organic deposits classified as bogs. They have derived chiefly from the accumulation of sphagnum and associated mosses and have a depth of at least 40 cm.

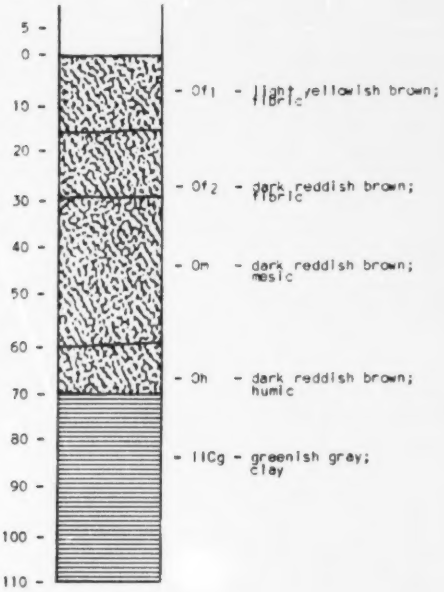
The soils are very poorly drained and usually located in depressional areas and abandoned stream channels where the water table is at or near the surface for a substantial part of the year. Catfish Creek soils overlie a variety of mineral deposits or occasionally bedrock.

Soil development is mostly Typic Mesisol. The deposits are usually deeper than 160 cm and the organic material throughout the middle tier is at an intermediate stage (mesic) of decomposition. Bogs which contain relatively undecomposed fibric organic material (Typic Fibrisols) are identified by the CC4 component. Bogs which have inclusions of shallow organic material (40-160 cm) over mineral soil are identified by the CC5 component; bogs which are dominantly shallow are indicated by component CC6.

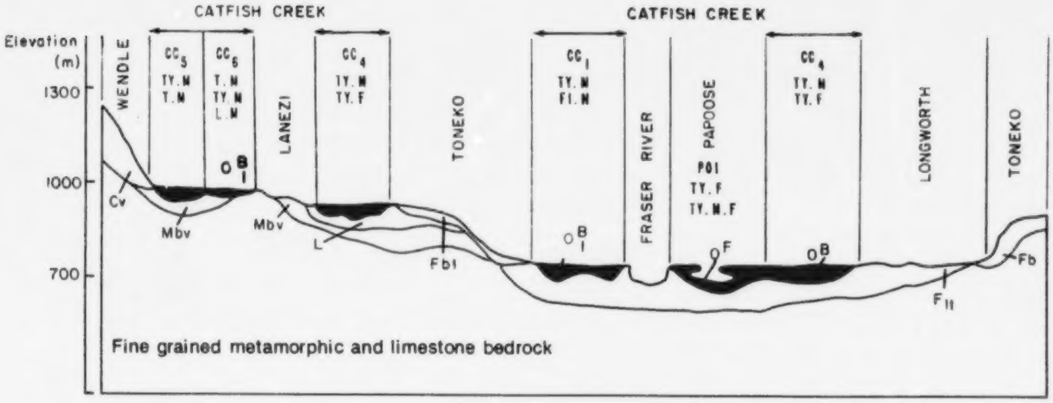
Catfish Creek soils occur in both the interior western hemlock - western red cedar zone and the interior western red cedar - white spruce zone of the Interior Wet Belt Region.

SOIL PROFILE

CC5: Terric Fibric Mesisol


5
0
10
20
30
40
50
60
70
80
90
100
110
- Of1 - light yellowish brown; fibric
- Of2 - dark reddish brown; fibric
- Om - dark reddish brown; mesic
- Oh - dark reddish brown; humic
- IICg - greenish gray; clay

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
CC1	Typic Mesisol		Very Poorly	>160
		Fibric Mesisol	Very Poorly	>160
CC4	Typic Mesisol		Very Poorly	>160
		Typic Fibrisol	Very Poorly	>160
CC5	Typic Mesisol		Very Poorly	>50
		Terric Mesisol	Very Poorly	>50
CC6	Terric Mesisol		Very Poorly	>50
		Typic Mesisol	Very Poorly	>160
		Lithic Mesisol	Very Poorly	40-160



CATFISH CREEK SOIL ASSOCIATION

CATFISH CREEK
CATFISH CREEK
Elevation (m)
1300
1000
700
WENDLE
CC_5
TY.M
T.M
CC_6
T.M
TY.M
L.M
O^B_I
LANEZI
CC_4
TY.M
TY.F
TONEKO
CC_1
TY.M
FI.M
O^B_I
FRASER RIVER
PAPOOSE
P01
TY.F
TY.M.F
O^F
CC_4
TY.M
TY.F
O^B
LONGWORTH
TONEKO
Cv
Mbv
Mbv
L
Fb1
F_{II}
Fb
Fine grained metamorphic and limestone bedrock

COMMENTS ON LAND USE

Agriculture.	Low to moderate capability. Excess soil moisture and a restricted growing season are the main limitations.
Forestry.	Very low capability. The very poor drainage severely limits tree growth.
Ungulates.	Low to moderate capability for moose and caribou.
Recreation.	Very low carrying capacity. Very poor drainage and low bearing strength severely limit recreational use.
Engineering.	Severe limitations. Very poor drainage and low bearing strength are major limiting factors.

CHIEF SOIL ASSOCIATION (CF)

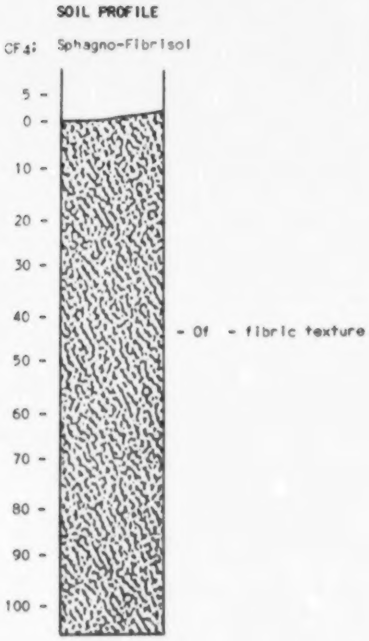
Chief soils are located in the Herrick, Framstead and Muller Creek drainages of the Rocky Mountains. They are situated in depressional to very gently sloping (0-2%) areas below 1000 m elevation.

The parent material is deep to shallow organic fen deposits, comprised mainly of undecomposed sedge peat. Water tables are usually at the surface. The association consists dominantly of Fibrisol soils as indicated by the CF1 component. The CF4 component identifies areas that also include a proportion of sphagnum moss.

McGregor and Moxley soils are commonly associated with the Chief soil association. Outside the study area, Mokus and Bednesti soil are associated as well.

This association was previously defined by Dawson (report in preparation) and mapped in the McGregor River area.

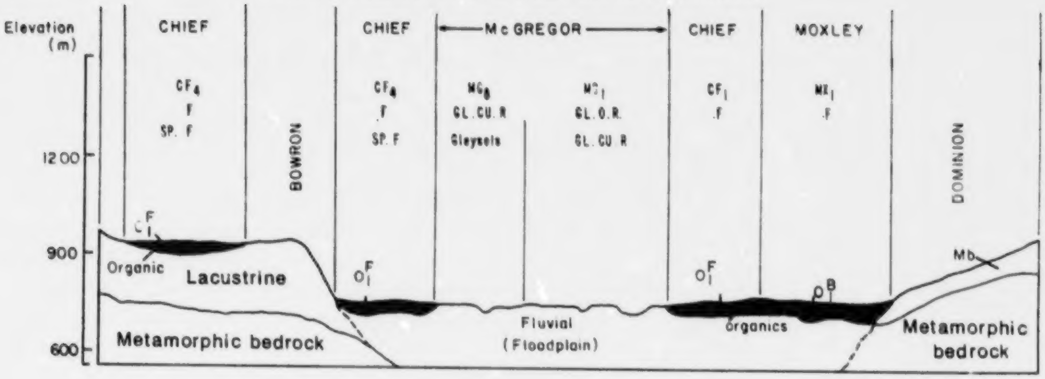
Chief soils occur within the Subboreal white spruce - alpine fir zone: common paper birch subzone.



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
CF1	Fibrisol		Very Poorly	>160
CF4	Fibrisol		Very Poorly	>160
		Sphagno-Fibrisol	Very Poorly	>160

Chief

MOXLEY, CHIEF AND McGREGOR SOIL ASSOCIATIONS


Elevation (m)
1200
900
600
CHIEF
CF$_4$
F
SP. F
BOWRON
CHIEF
CF$_4$
.F
SP. F
McGREGOR
MG$_8$
GL. CU. R
Gleysols
MG$_1$
GL. O. R.
GL. CU. R
CHIEF
CF$_1$
.F
MOXLEY
MX$_1$
.F
DOMINION
O$_1^F$
Organic
Lacustrine
Metamorphic bedrock
O$_1^F$
Fluvial
(Floodplain)
O$_1^F$
organics
O^B
Mb
Metamorphic bedrock

COMMENTS ON LAND USE

Agriculture.	Low capability. Excessive moisture, flooding, and adverse climate are the major limitations.
Forestry.	Very low capability. Very poor drainage restricts tree growth.
Ungulates.	Low to moderate capability for moose. Forage quantity is a main limitation.
Recreation.	Very low carrying capacity. Very poor drainage and a low bearing capacity severely limit recreational use.
Engineering.	Severe limitations. Very poor drainage, flooding and a low bearing capacity are the major limiting factors.

CUSHING SOIL ASSOCIATION (CS)

Cushing soils are located in the Rocky Mountains, mainly in the Cushing Creek Valley between elevations of 1000 to 1700 m. The parent materials dominantly consist of shallow colluvium which is subject to snow avalanching. The materials have variable textures ranging from rubbly sands to gravelly silt. Gravelly loams or sandy loams are most common however.

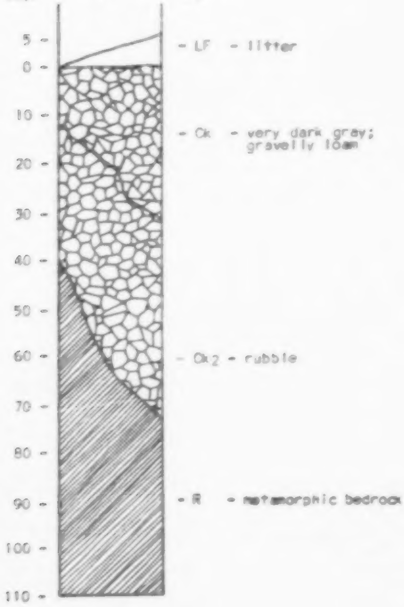
The Cushing association commonly occurs across the full valley profile. The valley floor materials forming the avalanche runout zone consist of deep gravelly silt colluvium. The steep valley walls consist of very shallow pockets of coarse, rubbly colluvium located between bedrock terracettes and form the avalanche tracks or snow chutes. The treeless chutes are often bounded by forested strips of mature alpine fir and white spruce. Here, deep well developed soils of the Hollidey association usually occur.

On the valley floors the colluvium sometimes overlays lacustrine sediments and are often forested. The underlying lacustrine materials are potentially very unstable and may be subject to piping, failure and collapse if disturbed.

The slopes of the Cushing association range from 5% to greater than 60%, and the soil drainage varies from well to imperfectly drained. Seepage from snow meltwater provides substantial areas with excessive soil moisture resulting in gleyed soils, particularly at the lower elevation. Due to a mixed lithology of dominantly calcareous metamorphic detritus, most soils are mildly alkaline throughout the solum.

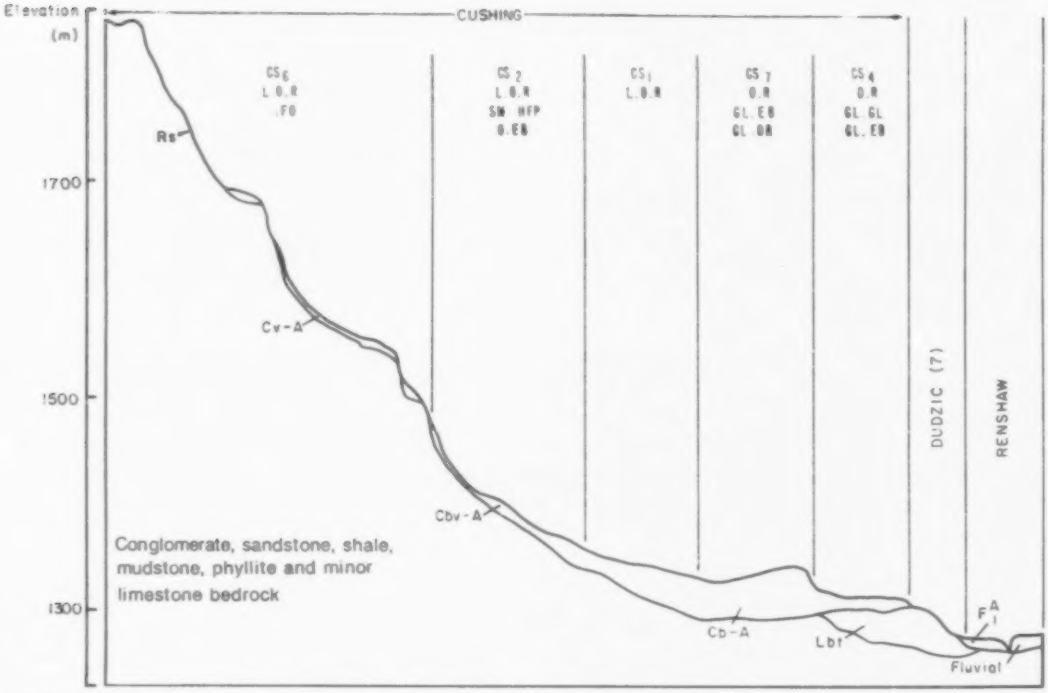
SOIL PROFILE

CS1: Lithic Orthic Regosol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LF - litter
- Ck - very dark gray; gravelly loam
- Ck2 - rubble
- R - metamorphic bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
CS1	Lithic Orthic Regosol		Well to Moderately Well	<50
CS2	Lithic Orthic Regosol		Well to Moderately Well	<50
		Sombric Humo-Ferric Podzol	Well to Moderately Well	50-100
		Orthic Eutric Brunisol	Well to Moderately Well	50-100
CS4	Orthic Regosol		Moderately Well	>100
		Gleyed Gray Luvisol	Imperfectly	>100
		Gleyed Eutric Brunisol	Imperfectly	>100
CS6	Lithic Orthic Regosol		Well	10-50
		Lithic Folisol	Imperfectly	10-40
CS7	Orthic Regosol		Moderately Well	>100
		Gleyed Eutric Brunisol	Imperfectly	>100
		Gleyed Orthic Regosol	Imperfectly	>100

CUSHING SOIL ASSOCIATION


Elevation (m)
CUSHING
CS6 L.O.R .FO
CS2 L.O.R SM.HFP O.EB
CS1 L.O.R
CS7 O.R GL.EB GL.OR
CS4 O.R GL.GL GL.EB
DUDZIC (7)
RENSHAW
1700
1500
1300
Rs
Cv-A
Cbv-A
Cb-A
Lbf
F A
Fluvial
Conglomerate, sandstone, shale, mudstone, phyllite and minor limestone bedrock

The dominant soil development, Lithic Orthic Regosol, is identified by the CS1 component. These soils are subject to very active snow avalanching and are usually treeless. The CS2 component consists of narrow vegetated strips of alder and/or mature white spruce in soil with Sombric Humo-Ferric Podzol and Orthic Eutric Brunisol development, and treeless, active avalanche chutes with Lithic Orthic Regosol development. The CS4 component is mapped in avalanche runout zones where colluvium overlies fluvial or lacustrine deposits; here heavier textures and seepage is evident from Gleyed Gray Luvisol and Gleyed Eutric Brunisol soil development. The CS6 member indicates very steep rocky slopes with Lithic Orthic Regosols together with Lithic Folisol usually occuring on the treads of the bedrock terracettes. The CS7 component includes areas of coarse, rubbly, deep colluvial that is subject to seepage.

Cushing soils occur in the Subalpine Engelmann spruce - alpine fir forest zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate, lithic soils and snow avalanching preclude agricultural uses.
Forestry.	Low capability. Lithic soils and active snow avalanching limit and usually restrict forest growth.
Ungulates.	Low to moderate moose capability. High grizzly bear capability. Components CS4 and CS7 include areas of deep, moist soil which have a relatively high capability for browse production in the early seral stages.
Recreation.	Severe limitations for recreational use. Snow avalanching, seasonally saturated soils, and adverse topography restrict use.
Engineering.	Severe limitations. Snow avalanching, steep slopes, and areas of complex stratigraphy (Component CS4) coupled with active seepage are the major limitations.

DEZAIKO SOIL ASSOCIATION (DZ)*

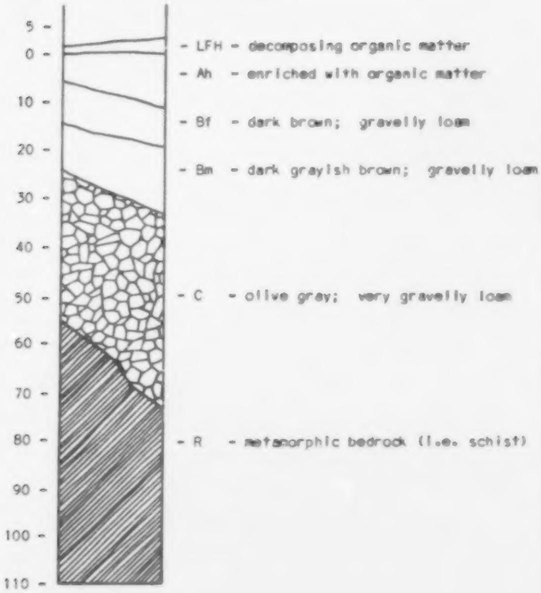
Dezaiko soils occur between 1050 and 1900 elevation, on the west side of the Continental Divide, in the Rocky Mountains. The soils have developed on a very strongly sloping (>30%) colluvial mantle and veneer which are derived from and usually overlies fine-grained metamorphic bedrock with inclusions of quartzite and limestone.

Soil textures range from gravelly silt loam to very gravelly sandy loam. The soils are usually well drained, permeable and well aerated. Many sites transmit relatively large volumes of seepage, particularly during snowmelt.

Dezaiko soils are dominantly Orthic Humo-Ferric Podzol. The DZ3 component occurs in colder environments located at higher elevations. This component has inclusions of soils with humus-rich surface horizons (Ah or Bhf) which contribute to Sombric Humo-Ferric and Ferro-Humic Podzol soil development. The DZ5 and DZ6 components have minor and major inclusions respectively of Lithic Orthic Humo-Ferric Podzol. The DZ11 component occurs in areas subject to snow avalanching where significant inclusions of Lithic Orthic Regosol and Sombric Humo-Ferric Podzol occur.

SOIL PROFILE

DZ3: Sombric Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ah - enriched with organic matter
- Bf - dark brown; gravelly loam
- Bm - dark grayish brown; gravelly loam
- C - olive gray; very gravelly loam
- R - metamorphic bedrock (i.e. schist)

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
DZ1	Orthic Humo-Ferric Podzol		Well	>50
DZ3	Orthic Humo-Ferric Podzol	Orthic Ferro-Humic Podzol	Well	>50
		Sombric Humo-Ferric Podzol	Well	>50
DZ5	Orthic Humo-Ferric Podzol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
DZ6	Lithic Orthic Humo-Ferric Podzol		Well	<50
		Orthic Humo-Ferric Podzol	Well	>50
DZ11*	Orthic Humo-Ferric Podzol		Well	>50
		Sombric Humo-Ferric Podzol; Lithic Orthic Regosol	Well	>20

DZ11* Prone to snow avalanching.

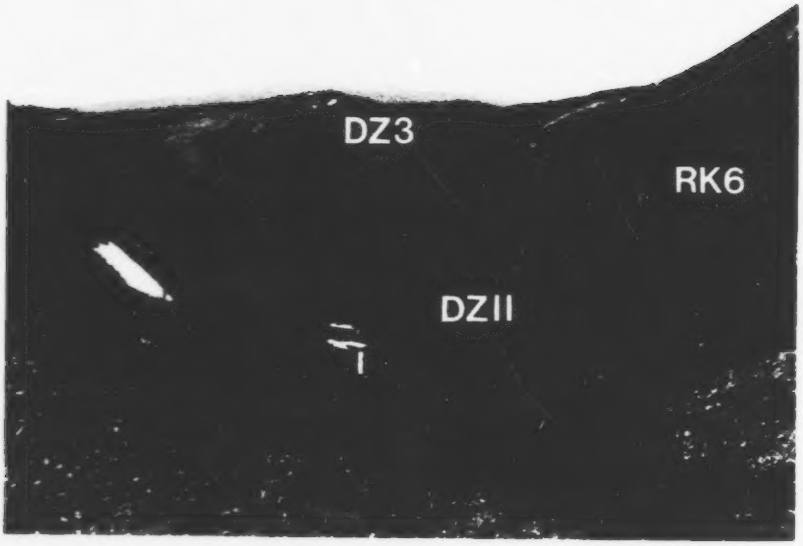


PLATE 3.1 DEZIAKO SOIL ASSOCIATION (DZ)

These acidic podzolic soils are developed in colluvium derived from a variety of metaorphic rock and till. The DZ 11 component is noteably different due to the process of snow-avalanching. (Photo by Kreg sky).

Dezaiko soils are mapped at elevations higher than the somewhat similar Barton soil association. Both occur in the Subboreal Region but Dezaiko soils occur in the Subalpine Engelmann spruce - alpine fir forest zone whereas Barton soils are limited to the Subboreal white spruce - alpine fir zone: common paper birch subzone.

*Refer to Barton Association for cross-sectional diagram.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate, steep topography, and stoniness preclude agricultural uses.
Forestry.	Low capability. The subalpine climate, snow pack and cool shallow soils limit forest growth.
Ungulates.	Low to moderate capability for caribou; low for moose. Excessive snow depth and low forage production due to the current stage of forest cover are the main limitations. Depending upon soil depth and soil moisture status the soils have a low to moderate capability for browse production during the early seral stages.
Recreation.	Low to very low carrying capacity. Steep slopes are the main limitations for recreational uses.
Engineering.	Severe limitations. Excessive slope, shallow soils, and areas subject to seepage and avalanching all pose limitations to engineering projects.

DOMINION SOIL ASSOCIATION (DO)

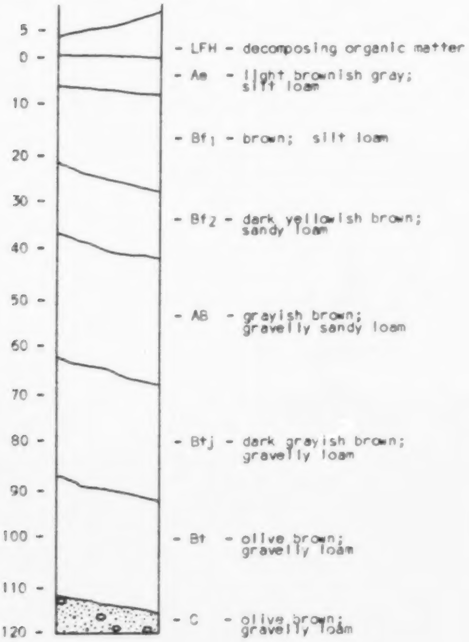
Dominion soils are located primarily in the Rocky Mountains at elevations below 1000 m. The soils are formed in gravelly loam or gravelly sandy loam morainal deposits which mainly occur on the valley floors and lower slopes of the Muller, Framstead and Herrick creek drainages. The compact, slowly pervious basal till is weathered to an average depth of about 70 cm and at this depth a clay accumulation zone helps restrict downward percolation of water; on sloping areas this zone usually causes excess soil water to seep laterally downslope.

Dominion soils are normally well or moderately well to imperfectly drained and the topography is gently to strongly sloping (2-30%). The soils are extremely acid throughout the upper solum, and generally non-calcareous for at least 100 cm depth.

The modal soil development of the Dominion association is Podzolic Gray Luvisol (D01 component). The D03 component occurs in climatically wetter areas where the zone of clay accumulation is located deeper in the soil profile; here Luvisolic Humo-Ferric Podzol and Orthic Humo-Ferric Podzol are common soil associates. Areas with inclusions of lithic soils are indicated by the D05 component. The D07 component indicates areas with inclusions of imperfectly drained soils. These periodically saturated inclusions are common throughout the Dominion soil landscapes. The D08 component indicates areas with inclusions of permanently saturated Gleysolic soils which often contain up to 60 cm of surface organic matter.

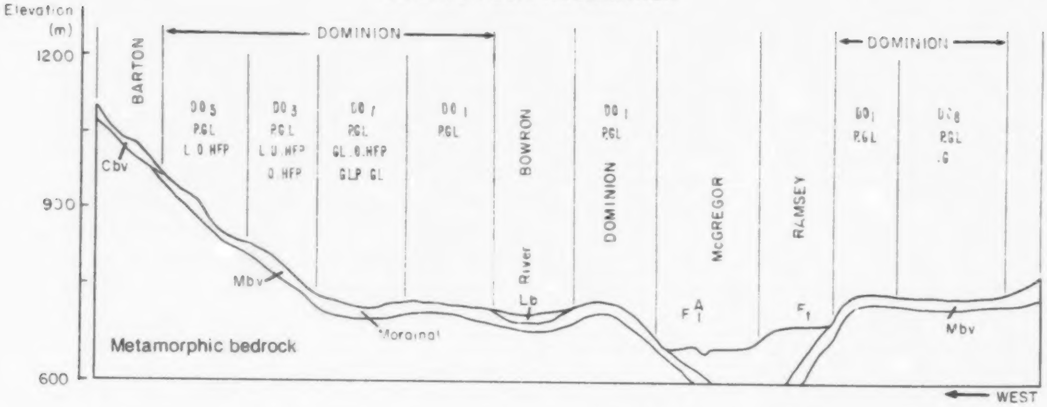
SOIL PROFILE

D01: Podzolic Gray Luvisol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
110 -
120 -
- LFH - decomposing organic matter
- Ae - light brownish gray; silt loam
- Bf1 - brown; silt loam
- Bf2 - dark yellowish brown; sandy loam
- AB - grayish brown; gravelly sandy loam
- Btj - dark grayish brown; gravelly loam
- Bt - olive brown; gravelly loam
- C - olive brown; gravelly loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
D01	Podzolic Gray Luvisol		Moderately Well	>50
D03	Podzolic Gray Luvisol		Moderately Well	>50
		Luvisolic Humo-Ferric Podzol; Orthic Humo-Ferric Podzol	Moderately Well	>50
D05	Podzolic Gray Luvisol		Moderately Well	>50
		Lithic Orthic Humo-Ferric Podzol	Moderately Well	<50
D07	Podzolic Gray Luvisol		Moderately Well	>50
		Gleyed Podzolic Gray Luvisol; Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50
D08	Podzolic Gray Luvisol		Moderately Well	>50
		Gleysolic	Poorly	>50

DOMINION SOIL ASSOCIATION


Elevation (m)
1200
900
600
BARTON
DOMINION
DO5 P.GL L.O.HFP
DO3 P.GL L.U.HFP O.HFP
DO7 P.GL GL.O.HFP GLP.GL
DO1 P.GL
BOWRON
River
Lb
DOMINION
DO1 P.GL
McGREGOR
F A 1
RAMSEY
F1
DOMINION
DO1 P.GL
DO8 P.GL .G
Cbv
Mbv
Morainal
Mbv
Metamorphic bedrock
WEST

This soil association has a lower silt and clay content than the Lanezi association which occurs in the Rocky Mountain Trench and is very similar to the Dominion soils mapped and described by Dawson (in preparation), and Lord (at press).

The Dominion soils of this report area are restricted to the Subboreal white spruce - alpine fir zone: common paper birch subzone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Low capability. Usually steep topography, excessive stoniness, and adverse climate are major limitations.
Forestry.	High capability. A combination of soil factors, such as massive firm subsoils and cold soil temperatures are slightly limiting.
Ungulates.	Low to moderate capability for moose. Winter snow depth is a limitation for other ungulates. The soils have a moderate to high capability for browse production during the early seral stages.
Recreation.	High to moderate carrying capacity. Steepness of slope largely determines the recreational carrying capacity.
Engineering.	Slight to severe limitations. The rating is dependent on steepness of slope, although frost action may be a problem.

DUDZIC SOIL ASSOCIATION (DC)

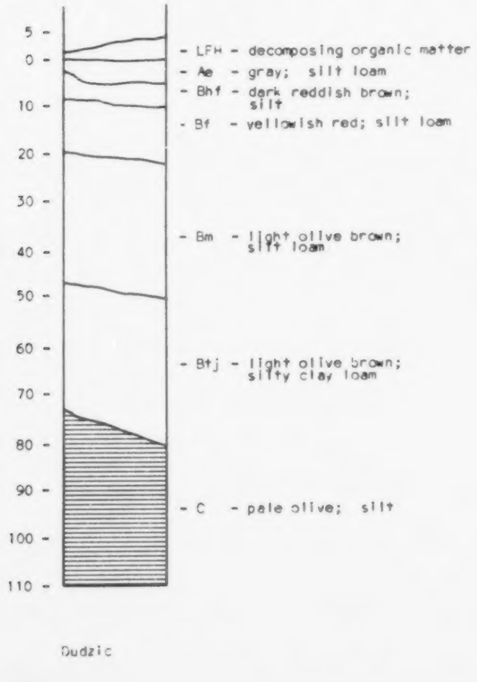
Dudzic soils occur in the Rocky Mountains between elevations of 1050 and 1600 m asl. They are developed in silty to fine sandy loam lacustrine sediments located in some of the major and minor valleys close to the Continental Divide. Generally, Dudzic soils occur in the upper Herrick and upper McGregor valleys at elevations just above the Bowes Creek and Bowron associations. Comparatively, the latter two associations have finer textures (silt loam to clay), receive less precipitation (being lower in elevation) and consequently are not as intensively podzolized. Ice contact features such as collapsed structures and isolated terraces provide some evidence these materials were deposited adjacent to glacial ice. The topography varies from very gently sloping (2-5%) lacustrine veneers, blankets and fans, to steeply sloping (71-100%) terrace remnants dissected by gullying.

The combination of steep slopes, silty to fine sandy textures and a relatively wet climate causes these soils to be very prone to erosion. Dudzic soils are extremely acid in the upper horizons, and depending upon the original source of the sediments may have either acid or calcareous subsoils.

The most common soil development of the Dudzic soil association is Orthic Humo-Ferric Podzol, component DC1. Component DC2 is mapped in drier landscape positions where Podzolic Gray Luvisols and Brunisolic Gray Luvisols also occur. Component DC7 includes areas subject to seepage such as at the base of slopes, many of which are in the form of silty colluvial fans. Component DC8 includes permanently saturated, poorly drained sites which often have peaty surface horizons. The DC11 component dominantly consists of areas which have been, or are presently, subject to failure and gullying, generally induced by seepage.

SOIL PROFILE

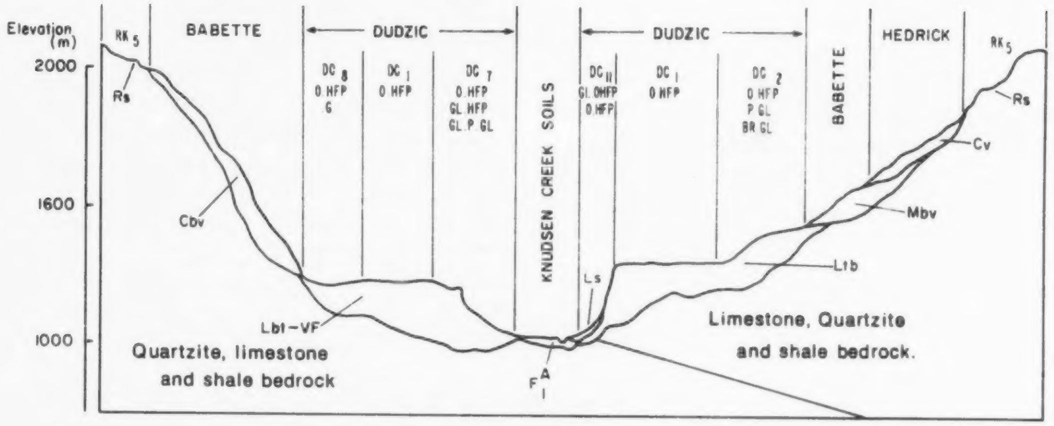
DC1; Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - gray; silt loam
- Bhf - dark reddish brown; silt
- Bf - yellowish red; silt loam
- Bm - light olive brown; silt loam
- Btj - light olive brown; silty clay loam
- C - pale olive; silt

Dudzic

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
DC1	Orthic Humo-Ferric Podzol		Well to Moderately Well	>100
DC2	Orthic Humo-Ferric Podzol		Well to Moderately Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
		Brunisolic Gray Luvisol	Moderately Well	>100
DC7	Orthic Humo-Ferric Podzol		Well to Moderately Well	>100
		Gleyed Humo-Ferric Podzol	Imperfectly	>100
		Gleyed Podzolic Gray Luvisol	Imperfectly	>100
DC8	Orthic Humo-Ferric Podzol		Moderately Well	>100
		Gleysolic	Poorly	>100
DC11	Gleyed Orthic Humo-Ferric Podzol		Imperfectly	>100
		Orthic Humo-Ferric Podzol	Moderately Well	>100

DUDZIC SOIL ASSOCIATION


Elevation (m)
2000
1600
1000
RK 5
Rs
BABETTE
DUDZIC
DC 8
O.HFP
G
DC 1
O.HFP
DC 7
O.HFP
GL.HFP
GL.P.GL
KNUDSEN CREEK SOILS
DUDZIC
DC 11
GL.OHFP
O.HFP
DC 1
O.HFP
DC 2
O.HFP
P.GL
BR.GL
BABETTE
HEDRICK
RK 5
Rs
Cv
Mbv
Ltb
Cbv
Lbl-VF
Ls
F A I
Quartzite, limestone and shale bedrock
Limestone, Quartzite and shale bedrock.

Dudzic soils occur in the Subalpine Engelmann spruce - alpine fir forest zone of both the Interior Wet Belt and Subboreal Regions. The soils are also described in "Biophysical Soil Resources and Land Evaluation of the Northeast Coal Study Area 1976-1977; Volume Two". (Vold et al., 1977).

COMMENTS ON LAND USE

Agriculture.	Low to very low capability. Adverse climate and sometimes steep topography are major limitations which preclude agricultural use.
Forestry.	Low to moderate capability. A moderately short growing season and cold soils are the major limitations to forest growth.
Ungulates.	Low capability for moose. Deep winter snow and the current successional stage of the forest impose some limitations to use. The deep, moist, medium textured soils have a relatively high capability for browse production during the early seral stages.
Recreation.	Moderate carrying capacity. Fine sandy and silty textures are susceptable to compaction and erosion.
Engineering.	Moderate to severe limitations. The fine sandy to silty sediments create poor subgrade characteristics, particularly when coupled with moist to wet soil conditions and steep slopes. Potential frost action is also a limiting factor. The steeper slopes are highly erodible and are potentially unstable.

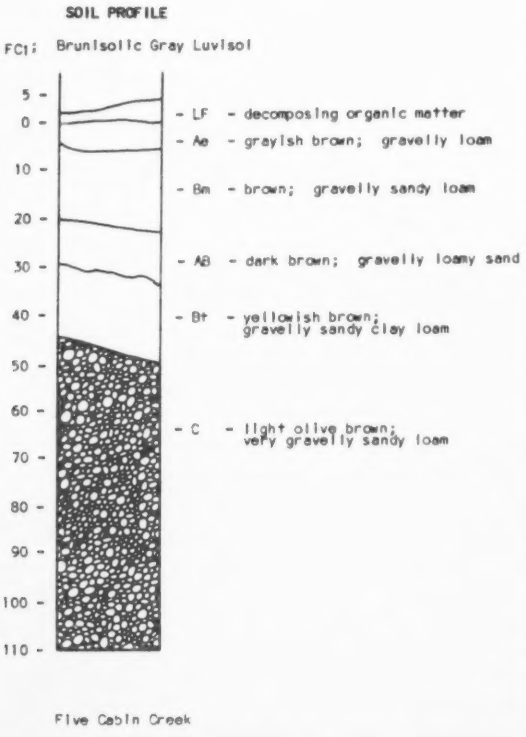
FIVE CABIN CREEK SOIL ASSOCIATION (FC)

Five Cabin Creek soils occur dominantly in the Rocky Mountain Foothills and to a minor extent in the Rocky Mountains. They are specifically located along relic and modern drainage routes. The soils occur on level to gently sloping (0-9%) topography between 1050 m and 1650 m elevation and have developed on gravelly sandy loam to very gravelly loamy sand fluvial and fluvioglacial deposits which are not subject to flooding.

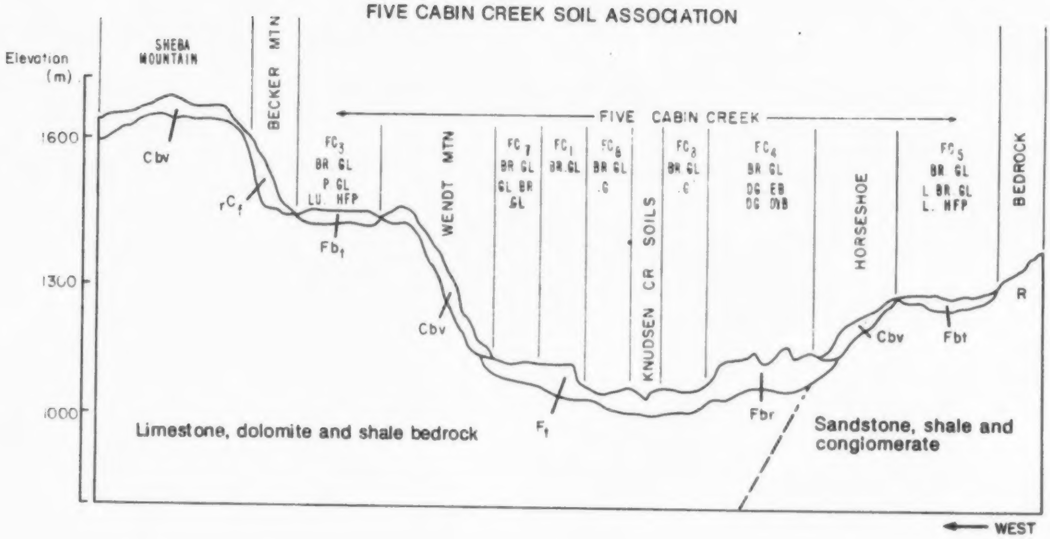
The texture and coarse fragment content of these soils are variable due to the divergent nature of fluvial stratification and deposition; coarse fragment content ranges from 30 to 80% by volume. The lithology is a mixture of sandstone, shale, limestone, dolomite and quartzite clasts.

The soils are usually well drained, moderately pervious and have a relatively low moisture holding capacity. Soil component members 1, 4 and 5 have the potential to warm more quickly during the spring, but usually experience droughty conditions during drier summers. Generally, Five Cabin Creek soils have a low nutrient status.

Modal soil development is Brunisolic Gray Luvisol, (component FC1). The occurrence of a weakly developed horizon of clay accumulation (Bt) horizon in the subsoil improves the water-holding capacity of this coarse textured soil. The FC3 component occurs in colder, wetter environments where inclusions of Podzolic Gray Luvisol and Luvisolic Humo-Ferric Podzol are common. Coarser-textured soils, usually with a greater gravel content, are included in the FC4 component. The FC5 component identifies inclusions of lithic soils. Areas which include gleyed and gleysolic soils are mapped as FC7 and FC8 respectively.


SOIL PROFILE
FC1: Brunisolic Gray Luvisol
5
0
10
20
30
40
50
60
70
80
90
100
110
- LF - decomposing organic matter
- Ae - grayish brown; gravelly loam
- Bm - brown; gravelly sandy loam
- AB - dark brown; gravelly loamy sand
- Bt - yellowish brown; gravelly sandy clay loam
- C - light olive brown; very gravelly sandy loam
Five Cabin Creek

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
FC1	Brunisolic Gray Luvisol		Well	>100
FC3	Brunisolic Gray Luvisol		Well	>100
		Podzolic Gray Luvisol	Well	>100
		Luvisolic Humo-Ferric Podzol	Well	>100
FC4	Brunisolic Gray Luvisol		Well	>100
		Degraded Eutric and Dystric Brunisol	Well	>100
		Orthic Humo-Ferric Podzol	Well	>100
FC5	Brunisolic Gray Luvisol		Well	>50
		Lithic Brunisolic Gray Luvisol	Well	<50
FC7	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>100
FC8	Brunisolic Gray Luvisol		Moderately Well	>100
		Gleysolic	Poorly	>100


FIVE CABIN CREEK SOIL ASSOCIATION
Elevation (m)
1600
1300
1000
SHEBA MOUNTAIN
BECKER MTN
FIVE CABIN CREEK
WENDT MTN
KNUDSEN CR SOILS
HORSESHOE
BEDROCK
FC3 BR GL P GL LU. HFP
FC7 BR GL GL BR GL
FC1 BR.GL
FC6 BR GL .G
FC8 BR GL .G
FC4 BR GL DG EB DG DYB
FC5 BR GL L BR GL L. HFP
Cbv
rCf
Fbt
Cbv
Ft
Fbr
Cbv
Fbt
R
Limestone, dolomite and shale bedrock
Sandstone, shale and conglomerate
WEST

Five Cabin Creek soils are often mapped with Holtslander and Knudsen Creek soil associations.

This association occurs in the Subalpine Engelmann spruce - subalpine fir forest zone.

COMMENTS ON LAND USE

Agriculture. Very low capability. Adverse subalpine climate, stoniness and periods of droughtiness are major limitations to agriculture.

Forestry. Low capability. The short growing season and low moisture-holding capacity of the soils limits the capability.

Ungulates. Low capability for moose. Excessive snow and relative droughtiness of the soils which limit browse production are the main limitations.

Recreation. Very high to high carrying capacity. These soils, being relatively level and well drained, are suitable for most recreational uses.

Engineering. Slight limitations. These soils have no major limitations for use. They are potential aggregate sources.

FONTONIKO ASSOCIATION (FN)

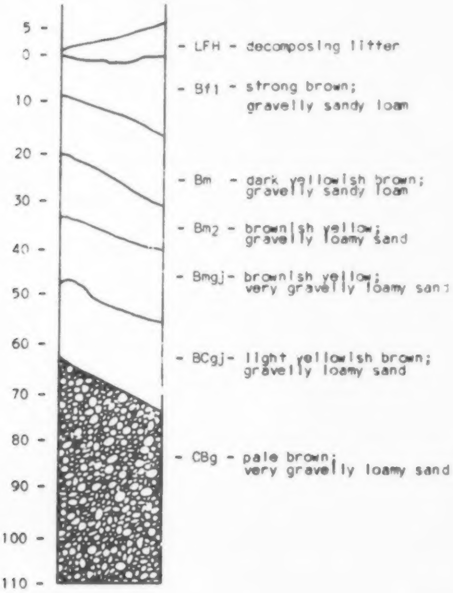
Fontoniko soils occur in the Rocky Mountain Trench, McGregor Plateau and Rocky Mountains between the elevational limits of 700 to 1440 m. These soils are developed on fluvial fans commonly located on valley floors where streams emanate from steep mountain slopes. The fans include a wide range of particle sizes which vary from very gravelly sands on strongly sloping (16-30%) areas, to weakly stratified, fine sandy deposits on gentle and moderate slopes (6-15%). Some fans which consist of steeper rubbly deposits are formed from rockfall in conjunction with fluvial deposition.

The lithology of the deposits varies according to the bedrock source, which may include limestone, schist, shale, quartzite and conglomerate. Water movement through these deposits varies from subsurface seepage to active streams which are currently depositing sediments and shifting channels. Soil drainage varies from rapid to imperfect depending upon the fan gradient, texture and hydrologic influences. On-site inspections of the hydrology should take place before the initiation of any construction which may alter the drainage.

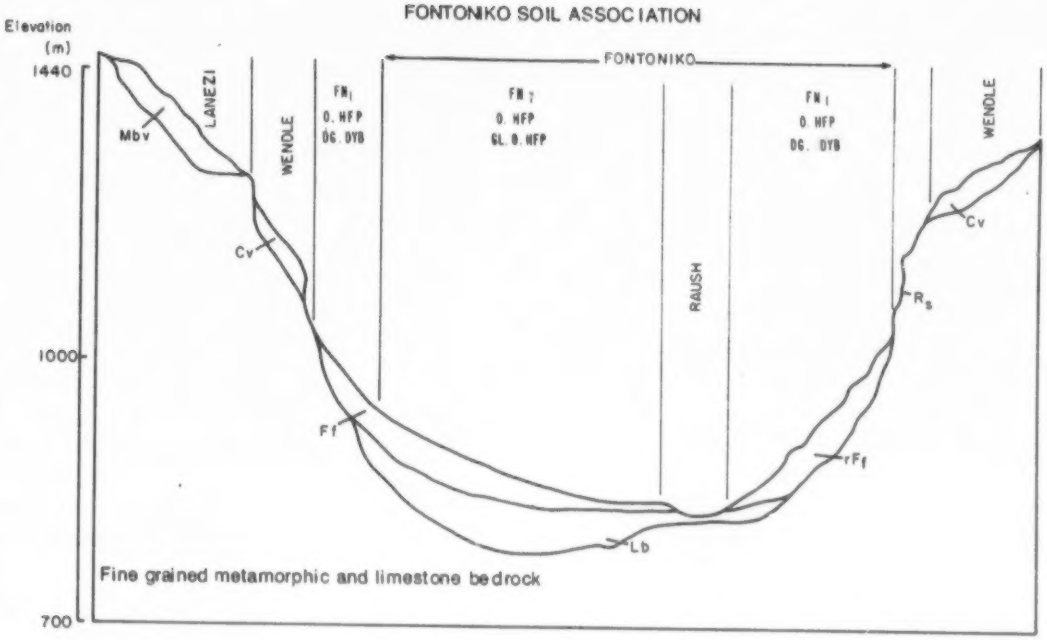
Fontoniko soils are most commonly mapped in conjunction with Raush, Toneko, Bowes Creek, Lanezi, and Wendle soil association. Consequently Fontoniko soils generally superimpose bedrock and/or the materials which are mapped adjacent to it.

SOIL PROFILE

FN1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing litter
- Bf1 - strong brown; gravelly sandy loam
- Bm - dark yellowish brown; gravelly sandy loam
- Bm2 - brownish yellow; gravelly loamy sand
- Bmgj- brownish yellow; very gravelly loamy sand
- BCgj- light yellowish brown; gravelly loamy sand
- CBg - pale brown; very gravelly loamy sand

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
FN1	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Degraded Dystric Brunisol	Moderately Well	>50
FN7	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50
		Gleyed Degraded Dystric Brunisol	Imperfectly	>50



The dominant soil developments are Orthic Humo-Ferric Podzol and Degraded Dystric Brunisol as indicated by component FN1; the degree of soil development depends upon the historical activity of the fan; component FN7 indicates inclusions of soils which are gleyed or subject to seepage; they usually overlie fine lacustrine sediments. This material is potentially problematic and hazardous due to saturated pockets of subsurface lacustrine which have low bearing capacity. The potential for piping and subsequent collapse is also a consideration in land use planning.

Fontoniko soils as described herein are similar to those mapped and described in the Barkerville Soil Report (Lord, at press).

Fontoniko soils occur in the interior western hemlock - western red cedar and interior western red cedar - white spruce forest zones of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low to moderate capability. Limitations depend upon slope, texture, flooding, coarse fragment content and the local climatic characteristics.
Forestry.	Moderate capability. A number of factors such as droughty sites, flooding and excessive coarse fragment content limit forest growth.
Ungulates.	Moderate capability for moose. Forage quantity varies with successional stages of the forest, drainage characteristics and moisture-holding capacity of each fluvial fan. During early seral stages, browse capability will range from low to high.
Recreation.	Moderate limitations. Potential flooding on some sites, coarse fragments and slope limit use.
Engineering.	Slight to severe limitations. Generally the slightly elevated gravelly deposits should provide adequate subgrade; however many sites are prone to spring freshets and possible subsurface instability; excess moisture at some locations may also be a persistant concern. Areas mapped as FN7 should have on-site inspections prior to development due to potential instability.

FOOTPRINT SOIL ASSOCIATION (FT)*

Footprint soils occur in the Rocky Mountain Foothills and Rocky Mountains between 1050 and 1700 m elevation. The topography includes gentle to strong slopes (5-30%). The soils have developed in clay loam to gravelly sandy loam cordilleran till which usually has a 15 to 50 cm overlay of sandy loam fluvial and/or eolian material. The till is usually calcareous below 50 cm depth, and overlies sandstone or shale bedrock. The soils are moderately well to well-drained.

Footprint soils are very susceptible to water erosion. Once surface gullies have established they are very prone to lateral erosion due to the hydrologic influence of the impermeable till subsoil.

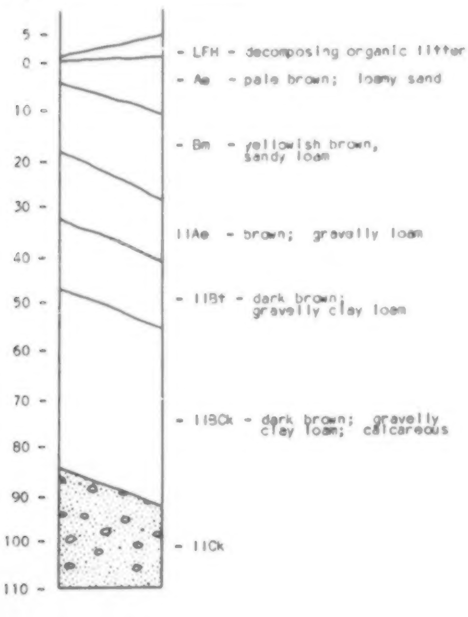
The dominant soil is Brunisolic Gray Luvisol. Areas with imperfect drainage support Gleyed Brunisolic Gray Luvisol and are included in the FT7 component.

The Hambrook soil association is frequently mapped in association with the Footprint soil association.

Footprint soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

SOIL PROFILE

FT1: Brunisolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
110
LFH - decomposing organic litter
Ae - pale brown; loamy sand
Bm - yellowish brown, sandy loam
IIAe - brown; gravelly loam
IIBt - dark brown; gravelly clay loam
IIBCk - dark brown; gravelly clay loam; calcareous
IICk

Footprint

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
FT7	Brunisolic Gray Luvisol		Moderately Well	>50
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>50

*Refer to Hambrook Association for cross-sectional diagram.

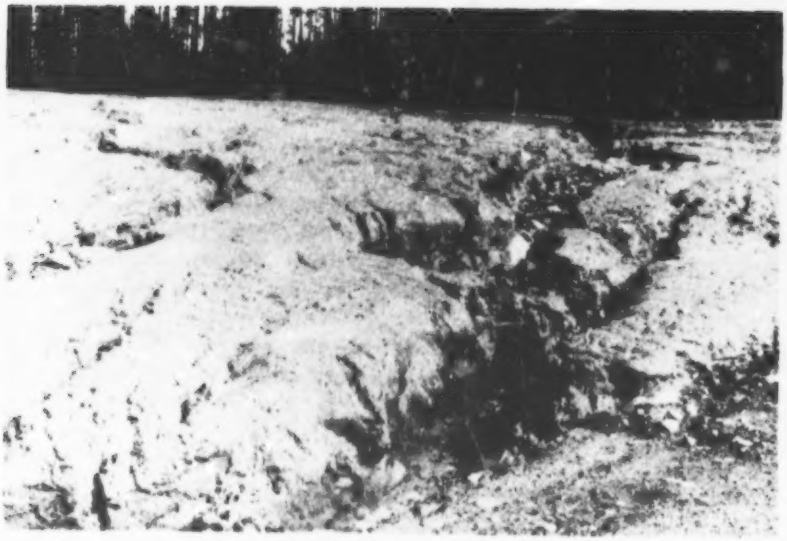


PLATE 3.2 FOOTPRINT SOIL ASSOCIATION (FT)

The sandy veneer which overlies till is very prone to erosion following land clearing. The Raush 4 and Toneko 4 soils have similar characteristics, except that these soils overlie lacustrine.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and inclusions of excessive stoniness are major limitations to agriculture.
Forestry.	Moderate capability. A short growing season and the low moisture-holding capacity pose major limitations to forest growth.
Ungulates.	Low to moderate capability for moose. Excessive winter snow depth and the present stage of forest cover limit use. The lower moisture holding capacity may limit the capability of browse production on the "drier" soil members. Gleyed and Gleysolic soils should provide a high capability for browse production during the early seral stages.
Recreation.	Generally high carrying capacity. Some sites are be restricted for recreation uses due to seepage and high water tables.
Engineering.	Slight limitations. Areas of imperfect and poor drainage may pose some restrictions to use. These soils have potential as aggregate sources.

FORGETMENOT SOIL ASSOCIATION (FG)

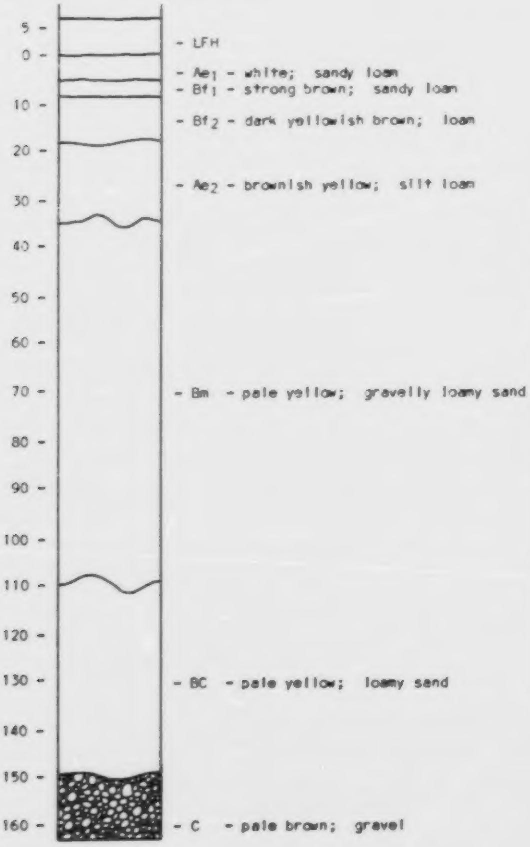
Forgetmenot soils are located in the Rocky Mountains south of the McGregor River and to a minor extent on the east flank of the Cariboo Mountains between the elevations of 1000 to 1500 m. The parent materials consist of deep gravelly fluvial and glaciofluvial deposits usually in the form of terraces. They are generally located along the valley floor of the Morkill River, and Forgetmenot and Cushing creeks. These deposits consist of well to poorly-sorted sands and gravels; the surface horizons often consist of up to 50 cm of stone-free sand.

The topography is very gently sloping (2-5%) on the tread of terraces and steeply sloping (71-100%) on the terrace escarpments. Slope failures are common where rivers continue to undercut many of the steep gravelly escarpments.

The soils are usually rapidly to well drained with inclusions of imperfectly and poorly-drained soils in lower slope, seepage receiving positions. The moisture-holding capacity is low and the permeability is moderate to rapid. These soils may be prone to moisture deficiencies during drier summers. They are very strongly acid in the solum, and depending upon the source of the materials some soils may be calcareous at depth (>100 cm). Soil textures are usually loamy sand or sandy loam with a 20 to 40% coarse fragment content.

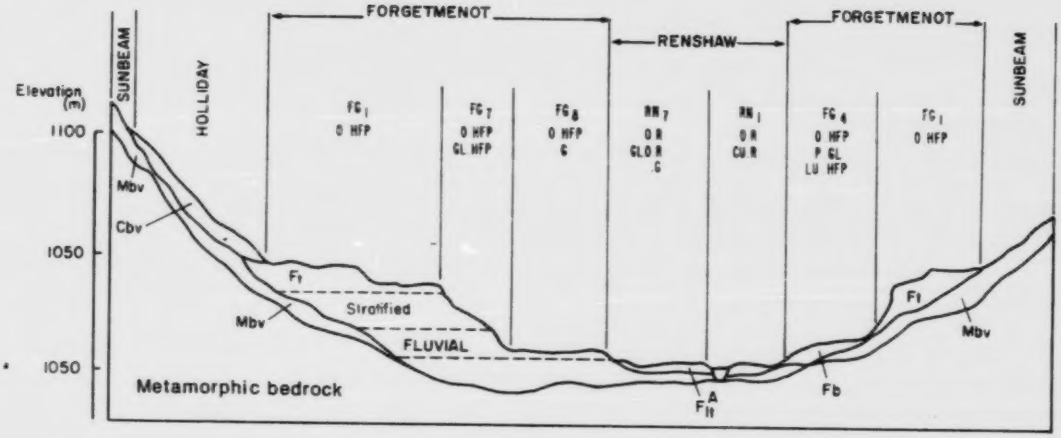
SOIL PROFILE

FG1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
- LFH
- Ae1 - white; sandy loam
- Bf1 - strong brown; sandy loam
- Bf2 - dark yellowish brown; loam
- Ae2 - brownish yellow; silt loam
- Bm - pale yellow; gravelly loamy sand
- BC - pale yellow; loamy sand
- C - pale brown; gravel

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
FG1	Orthic Humo-Ferric Podzol		Rapidly to Well	>100
FG4	Orthic Humo-Ferric Podzol		Rapidly to Well	>100
		Podzolic Gray Luvisol	Well to Moderately Well	>100
		Luvisolic Humo-Ferric Podzol	Well to Moderately Well	>100
FG7	Orthic Humo-Ferric Podzol		Well to Imperfectly	>100
		Gleyed Humo-Ferric Podzol	Imperfectly	>100
FG8	Orthic Humo-Ferric Podzol		Well	>100
		Gleysolic	Poorly	>100

FORGETMENOT SOIL ASSOCIATION


FORGETMENOT
RENSHAW
FORGETMENOT
SUNBEAM
HOLLIDAY
SUNBEAM
Elevation (m)
1100
1050
1050
FG1
0 HFP
FG7
0 HFP
GL HFP
FG8
0 HFP
G
RN7
0 R
GL0 R
.G
RN1
0 R
CU R
FG4
0 HFP
P GL
LU HFP
FG1
0 HFP
Mbv
Cbv
Ft
Stratified
FLUVIAL
Mbv
Metamorphic bedrock
F_{lt}^{A}
Fb
Ft
Mbv

The modal soil in the Forgetmenot association is Orthic Humo-Ferric Podzol as indicated by the FG1 component. Some deposits have a slightly higher clay content which results in horizons of clay accumulation; these inclusions are indicated by the FG4 component. The FG7 component indicates inclusions of soils which are gleyed due to seepage and/or a periodic high water table. The FG8 component includes soils which are permanently saturated and often contain up to 60 cm of surface organic accumulation.

The Forgetmenot association, similar to Ptarmigan association which is located at lower elevations in the Interior western hemlock - western red cedar forest zone, is located in the Subalpine Engelmann spruce - subalpine fir forest zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and inclusions of excessive stoniness are major limitations to agriculture.
Forestry.	Moderate capability. A short growing season and the low moisture-holding capacity pose major limitations to forest growth.
Ungulates.	Low to moderate capability for moose. Excessive winter snow depth and the present stage of forest cover limit use. The lower moisture holding capacity may limit the capability of browse production on the "drier" soil members. Gleyed and Gleysolic soils should provide a high capability for browse production during the early seral stages.
Recreation.	Generally high carrying capacity. Some sites are be restricted for recreation uses due to seepage and high water tables.
Engineering.	Slight limitations. Areas of imperfect and poor drainage may pose some restrictions to use. These soils have potential as aggregate sources.

FRAMSTEAD SOIL ASSOCIATION (FR)

Framstead soils are located just west of the Continental Divide in the Rocky Mountains between the elevations of 1000 and 1200 m and occurs on the extensively modified lacustrine sediments found in the upper Framstead and Herrick valleys. The soils are developed in fine sandy loam to silt loam colluvial fans, aprons and veneers derived from eroding, falling and avalanched lacustrine escarpments and terraces. In most cases the fans and aprons superimpose the original lacustrine sediments and maintain a similar textural range.

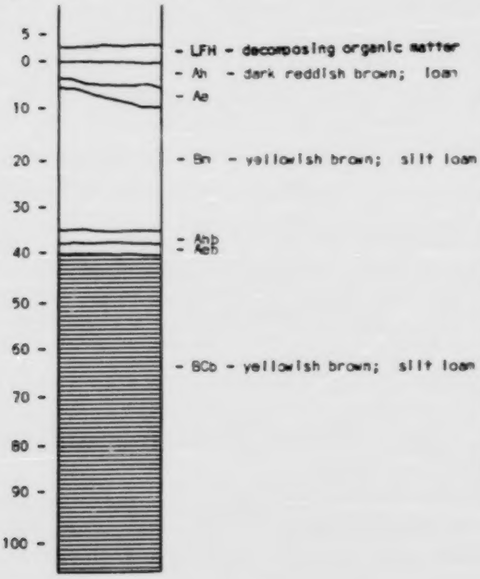
These soils are usually moist due to high moisture-holding capacity and the copious seepage which emanates from the numerous small drainages along the valley walls.

The fans and aprons, when located at the base of escarpments and across the narrow valley floor, have very gentle to gentle slopes (2 to 9%). The extensive gullied and falling terrain includes strong to steep slopes (16 to 100%); slopes on terrain which supports snow avalanche run-out zones seldom exceed 30%.

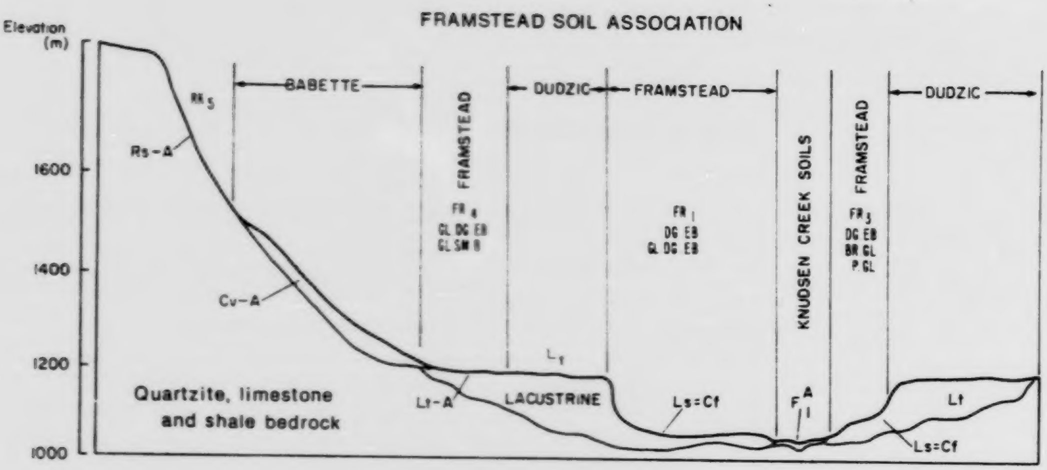
Framstead soils are very susceptible to failures due to their slope, texture and high moisture content; these soils are geologically hazardous.

SOIL PROFILE

FR$_1$: Degraded Eutric Brunisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ah - dark reddish brown; loam
- Ae
- Bm - yellowish brown; silt loam
- Ahb
- Aeb
- BCb - yellowish brown; silt loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
FR1	Degraded Eutric Brunisol		Moderately Well	>100
		Gleyed Degraded Eutric Brunisol	Imperfectly	>100
FR3	Degraded Eutric Brunisol		Moderately Well	>100
		Brunisolic Gray Luvisol	Moderately Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
FR4	Gleyed Degraded Eutric Brunisol		Imperfectly	>100
		Gleyed Sombric Brunisol	Imperfectly	>100


FRAMSTEAD SOIL ASSOCIATION
Elevation (m)
1600
1400
1200
1000
BABETTE
FRAMSTEAD
DUDZIC
FRAMSTEAD
KNUDSEN CREEK SOILS
FRAMSTEAD
DUDZIC
RR5
Rs-A
Cv-A
FR4
GL DG EB
GL SM B
FR1
DG EB
GL DG EB
FR3
DG EB
BR GL
P GL
Lf
Quartzite, limestone and shale bedrock
Lf-A
LACUSTRINE
Ls=Cf
F A I
Lf
Ls=Cf

The modal soil, is usually a Degraded Eutric Brunisol with substantial gleyed inclusions. The FR3 component is mapped where on-site inspections have shown inclusions of Brunisolic Grey Luvisol and Podzolic Grey Luvisol soil development. The FR4 component includes areas which are subject to snow avalanching. Here the soils are continuously moist, gleyed and usually treeless. They normally have organic matter enriched (sombric) surface horizons due to the lush herb growth and addition of organic debris deposited with snow avalanches.

Framstead soils are located in the Subalpine Engelmann spruce - alpine fir forest zone of both the Interior Wet Belt and Subboreal Regions.

COMMENTS ON LAND USE

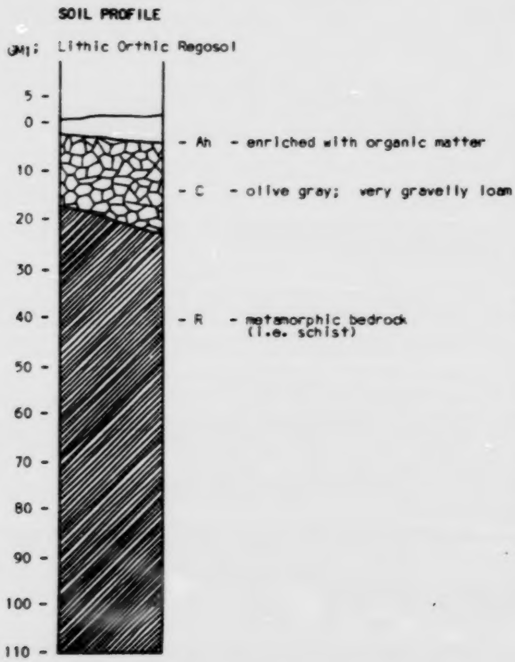
Agriculture.	Very low capability. Steep slopes, active erosion, and the adverse climate preclude agriculture.
Forestry.	Moderate to very low capability. The intensity of erosional processes, coupled with the subalpine climate impose varing limitations to forest growth.
Ungulates.	Moderate capability for moose. Excessive snow depth is a major limitation. Sites not prone to excessively active erosion have a moderate to high capability for browse production during the early seral stages.
Recreation.	Very low capability. Steep slopes and erosion are the major limitations.
Engineering.	Severe limitations. Steep slopes, frost action and erosion are major limitations. Also, the silty textures, coupled with a high moisture content, create potentially unstable subgrade conditions.

GABLE MOUNTAIN SOIL ASSOCIATION (GM)

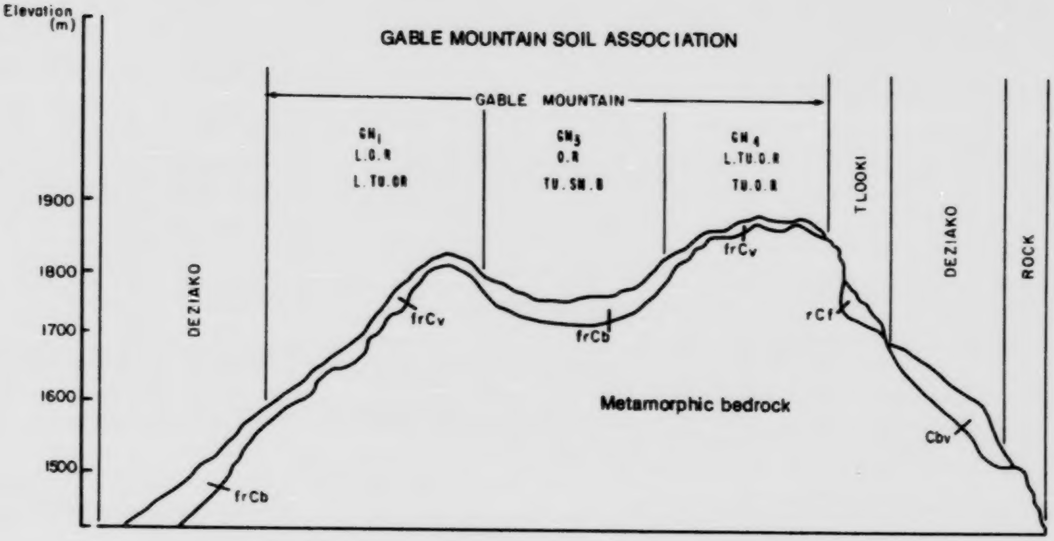
Gable Mountain soils occur at the highest elevations, usually greater than 1600 m, in the Rocky Mountains on the west side of the Continental Divide. They occur mainly in the northwest portions of the Study Area; for example, some of the alpine areas surrounding the Herrick Valley are occupied by Gable Mountain soils. The soils have developed on very thin colluvium overlying non-calcareous, fine-grained schist and phyllite with inclusions of quartzites, conglomerate, limestone and shale. The textures vary from very gravelly sandy loam to silt loam. Topography is generally moderately to steeply sloping (10 to 80%). The soil is usually moderately well drained with inclusions of poorly drained depressions and rapidly drained, steep, rubbly slopes.

Periglacial (cold climate) processes have prevented development of distinctive soil horizons. The modal soil (component GM1) constists of both Lithic Orthic Regosol and Lithic Turbic Orthic Regosol soil developments. The GM3 component indicates areas of moderate and strong slopes where deeper, somewhat finer textured soils occur; here inclusions of Turbic Sombric Brunisols are common. Areas which include exposed ridges subject to intense frost action are indicated by the GM4 component symbol.

Gable Mountain soils occur in the Alpine Tundra zone of the Subboreal Region.


SOIL PROFILE
GM1; Lithic Orthic Regosol
5
0
10
20
30
40
50
60
70
80
90
100
110
- Ah - enriched with organic matter
- C - olive gray; very gravelly loam
- R - metamorphic bedrock (i.e. schist)

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
GM1	Lithic Orthic Regosol		Moderately Well	<50
		Lithic Turbic Orthic Regosol	Moderately Well	<50
GM3	Orthic Regosol		Moderately Well	>50
		Turbic Sombric Brunisol	Moderately Well	>50
GM4	Lithic Turbic Orthic Regosol		Moderately Well	<50
		Turbic Orthic Regosol	Moderately Well	>50


Elevation (m)
GABLE MOUNTAIN SOIL ASSOCIATION
GABLE MOUNTAIN
GM_1
L.O.R
L.TU.OR
GM_3
O.R
TU.SH.B
GM_4
L.TU.O.R
TU.O.R
TLOOKI
DEZIAKO
DEZIAKO
ROCK
1900
1800
1700
1600
1500
frCv
frCb
frCv
rCf
Metamorphic bedrock
Cbv
frCb

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse alpine climate precludes agriculture.
Forestry.	Very low capability. The alpine climate is too extreme for tree growth.
Ungulates.	Low to moderate capability for goat and caribou. Excess winter snow depth and the relatively low quantity of forage are the main limitations.
Recreation.	Very low carrying capacity. High soil sensitivity due to periglacial (or cold climate) processes, shallowness to bedrock and steep slopes are severely limiting.
Engineering.	Severe limitations. Steep slopes, shallowness to bedrock, and frost action are severely limiting to engineering installations.

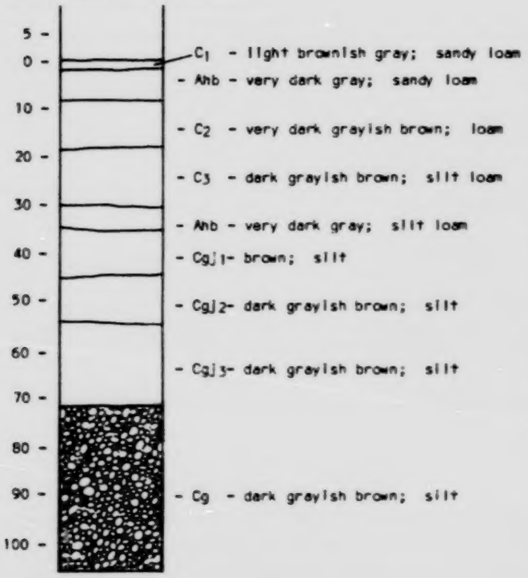
GUILFORD SOIL ASSOCIATION (GF)

Guilford soils occur in the Rocky Mountain Trench and to a lesser extent in the McGregor Plateau and Rocky Mountains, between the elevational limits of 650 to 1440 m. The major locations of the soils are on the floodplain of the Fraser River and to a lesser extent on the McGregor River. The soils are generally subject to a seasonally high water table, with the lower terraces being frequently inundated during periods of flood or high water. The textures of these recent alluvial deposits vary due to the nature of deposition; sandy loam to silt is the common textural range. The topography is nearly level to very gently sloping with some inclusions of depressional sites.

Soil reaction ranges from mildly alkaline to slightly acid depending upon the frequency of flooding and the degree of soil weathering. Mull humus is often found on the soil surface and a series of thin mull horizons are buried to depths greater than 1 m. This makes the soil moderately high in organic matter content and plant nutrients. The soils are imperfectly to moderately well drained and moisture, air and plant roots penetrate the soil easily. Runoff is slow, internal drainage is moderate and the moisture-holding capacity is low to moderate.

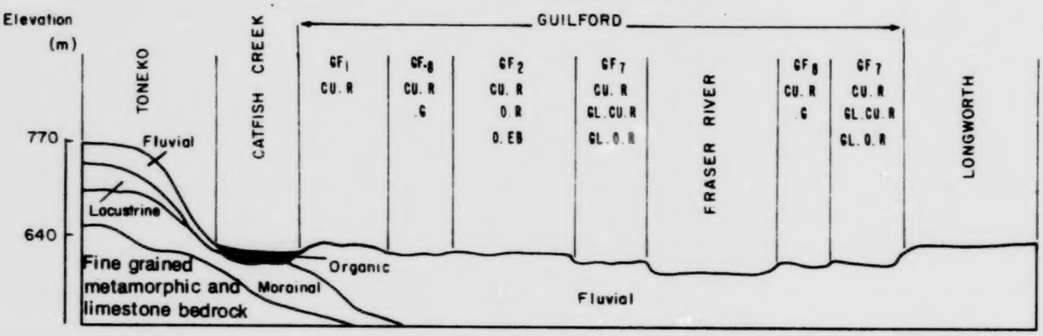
SOIL PROFILE

GF7; Gleyed Cumulic Regosol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
C1 - light brownish gray; sandy loam
- Ahb - very dark gray; sandy loam
- C2 - very dark grayish brown; loam
- C3 - dark grayish brown; silt loam
- Ahb - very dark gray; silt loam
- Cgj1- brown; silt
- Cgj2- dark grayish brown; silt
- Cgj3- dark grayish brown; silt
- Cg - dark grayish brown; silt

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
GF1	Cumulic Regosol		Moderately Well	>100
GF2	Cumulic Regosol		Moderately Well	>100
		Orthic Regosol; Orthic Eutric Brunisol	Moderately Well	>100
GF7	Cumulic Regosol		Moderately Well	>100
		Gleyed Cumulic Regosol; Gleyed Orthic Regosol	Imperfectly	>100
GF8	Cumulic Regosol		Moderately Well	>100
		Gleysolic	Poorly	>100

GUILFORD SOIL ASSOCIATION


Elevation
(m)
770
640
TONEKO
CATFISH CREEK
GUILFORD
GF1
CU. R
GF8
CU. R
.G
GF2
CU. R
O. R
O. EB
GF7
CU. R
GL. CU. R
GL. O. R
FRASER RIVER
GF8
CU. R
G
GF7
CU. R
GL. CU. R
GL. O. R
LONGWORTH
Fluvial
Locustrine
Fine grained metamorphic and limestone bedrock
Morainal
Organic
Fluvial

The dominant soil development is Cumulic Regosol (component GF1). Soils located on slightly higher terraces where flooding is less frequent, include Orthic Regosols and Orthic Eutric Brunisols (component GF2). Areas affected by seepage and periodic high water tables are gleyed and inclusions of Gleyed Cumulic Regosols and Gleyed Orthic Regosols are very common (component GF7). Soils which are subject to prolonged saturation are Gleysolic and often have 40 to 60 cm of organic accumulation at the surface. These are included in GF8. This component is mapped almost exclusively on the floodplains of the McGregor and Torpy Rivers and here indicates a cooler environment than is common for Guilford soil components found on the Fraser River floodplain.

This association is very similar to the McGregor soil series as mapped and described in Report No. 10, "Soils of the Upper Part of the Fraser Valley" (Hortie et al., 1970).

Guilford soils occur mainly in the interior western red cedar - white spruce zone and to a lesser extent in the interior western hemlock - western red cedar zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Moderate capability. A seasonally high water table and inundation are the major limitations.
Forestry.	High capability. A seasonally high water table and inundation impose some limitations to forest growth.
Ungulates.	High capability for moose, moderate for mule deer. Snow depth limitations and forestry-agriculture use patterns determine degree of wildlife use. The deep, medium textured soils have a high capability for browse production during the early seral stages.
Recreation.	Very low carrying capacity. Flooding limits recreational installations such as campgrounds and trails.
Engineering.	Severe limitations. The incidence of flooding and high water tables pose major constraints to most engineering uses.

HAMBROOK SOIL ASSOCIATION (HB)

Hambrook soils usually occur below 1600 m elevation on the long slopes and subdued valley floors within the Rocky Mountain Foothills. The slopes range from 5 to 40%. The soils have developed on loam or clay loam cordilleran till; this material is compact, very stony and strongly calcareous below 50 cm depth. The till is derived from a mixture of limestone, sandstone and shale and usually overlies non-calcareous sandstone and shale bedrock.

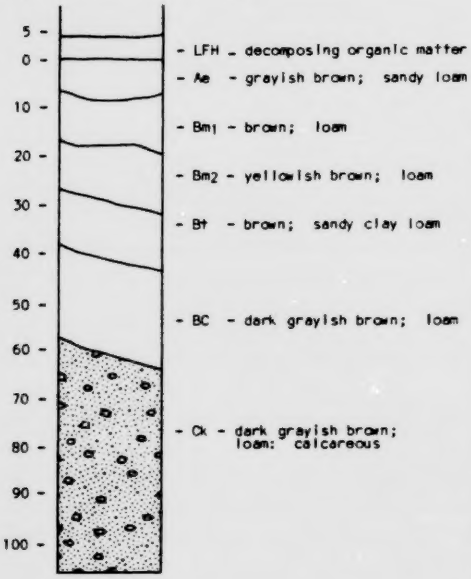
Hambrook soils are well to moderately well drained with numerous gleyed inclusions which occur at the base of long seepage slopes, as well as in depressional sites. The soils have a high moisture holding capacity and are subject to surface erosion and frost heaving. Following land clearing and during intense rainfall, these soils will likely erode and become potential sediment sources.

Soil reaction to approximately 40 cm depth is medium acid. Below this depth a zone of slowly permeable illuvial clay (Bt horizon) occurs which is neutral to mildly alkaline.

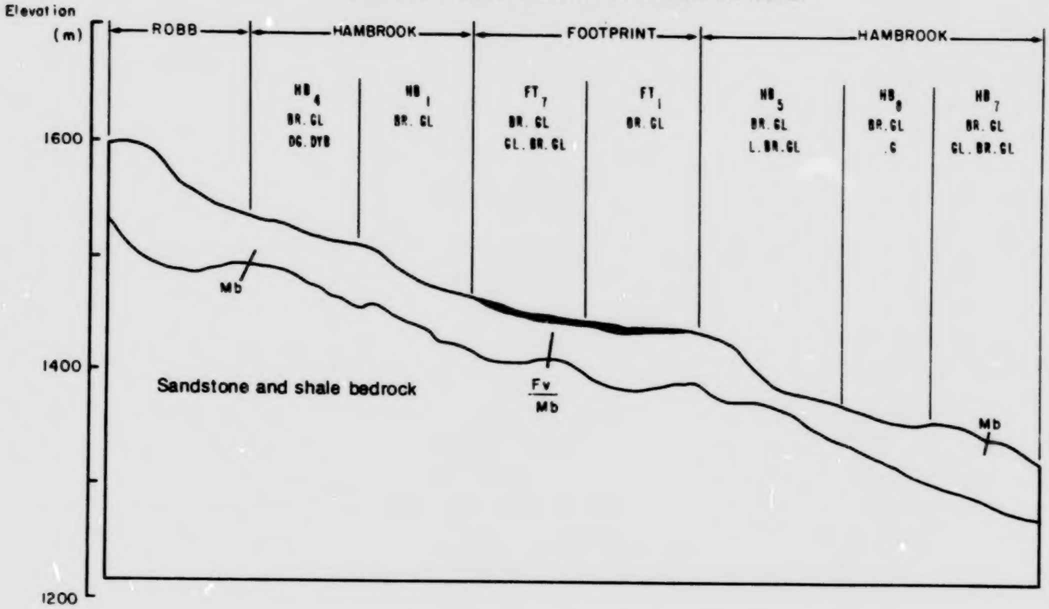
The dominant soil development is Brunisolic Gray Luvisol, component HB1. Somewhat coarser-textured areas are included in component HB4. Inclusions of shallow to bedrock areas with Lithic Brunisolic Gray Luvisol development are indicated by the HB5 component. Areas with inclusions of imperfect and poor drainage are included in the HB7 and HB8 components respectively.

SOIL PROFILE

HB_1; Brunisolic Gray Luvisol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
- LFH _ decomposing organic matter
- Ae - grayish brown; sandy loam
- Bm$_1$ - brown; loam
- Bm$_2$ - yellowish brown; loam
- Bt - brown; sandy clay loam
- BC - dark grayish brown; loam
- Ck - dark grayish brown; loam: calcareous

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HB1	Brunisolic Gray Luvisol		Well to Moderately Well	>50
HB4	Brunisolic Gray Luvisol		Well to Moderately Well	>50
		Degraded Dystric Brunisol	Well to Moderately Well	>50
HB5	Brunisolic Gray Luvisol		Well to Modately Well	>50
		Lithic Brunisolic Gray Luvisol	Well to Moderately Well	<50
HB7	Brunisolic Gray Luvisol		Moderately Well	>50
		Gleyed Brunisol Gray Luvisol	Imperfectly	>50
HB8	Brunisolic Gray Luvisol		Moderately Well	>50
		Gleysolic	Poorly	>50



HAMBROOK AND FOOTPRINT SOIL ASSOCIATIONS

Elevation (m)
1600
1400
1200
ROBB
HAMBROOK
FOOTPRINT
HAMBROOK
HB4 BR.GL DG.DYB
HB1 BR.GL
FT7 BR.GL GL.BR.GL
FT1 BR.GL
HB5 BR.GL L.BR.GL
HB8 BR.GL .G
HB7 BR.GL GL.BR.GL
Mb
Sandstone and shale bedrock
Fv/Mb
Mb

Hambrook soils differ from Bastille soils on the basis of calcareousness, host bedrock and soil development. Footprint soils are often mapped in association with Hambrook soils in areas where a sandy capping overlies the till.

The Hambrook association is located within the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and steep topography severely limit agricultural uses.
Forestry.	Low capability. A short growing season and a relatively shallow rooting depth limit forest growth.
Ungulates.	Low capability for moose. Winter snow depth and low forage quantity due to the current mature stage of forest cover are main limitations. The medium textured soils have moderate to high capability for browse production during the early seral stages. Ratings here depend primarily upon soil moisture conditions.
Recreation.	Moderate carrying capacity. Moderately fine textures and a relatively impervious horizon limit the capacity.
Engineering.	Slight to severe limitations. The rating is dependent on the slope of the mapping unit, although potential frost action is a consideration.

HEDRICK SOIL ASSOCIATION (HK)

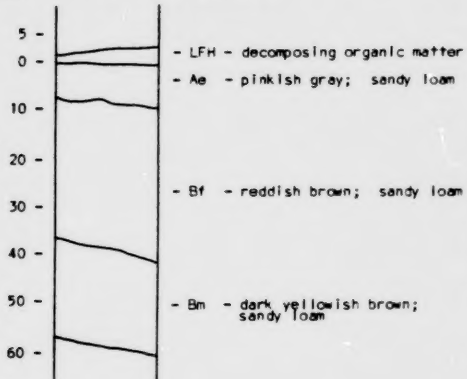
The Hedrick soil association occurs throughout the Rocky Mountains between the elevations of 1050 to 1900 m. It is developed in colluvium derived from and generally overlying weathered limestone, dolomite and minor sandstone, siltstone and shale. The colluvial parent material ranges in texture from very gravelly sandy loam to gravelly silt loam; frequently a substantial volume of angular cobbles, stones and boulders are also present.

The soils occur on topography which ranges from strongly (16-30%) to very strongly sloping (31-45%). The surface soil is usually very strongly acid to about 50 cm depth; the subsoil is usually calcareous near the bedrock contact or within 100 cm of the soil surface. Hedrick soils have a loose porous matrix and are rapidly to moderately pervious; they are generally well drained.

The modal soil development is Orthic Humo-Ferric Podzol. In colder environments at higher elevations, soils with an Ah horizon occur; these are included in the HK3 component. The HK4 component usually contains finer-textured, gravelly silt loam or loam and significant inclusions of soils which contain horizons of clay accumulation. The HK5 component is mapped where minor areas of lithic soils occur, and HK6 component is mapped where lithic soils are dominant. The HK7 component commonly occurs at the base of slopes which are influenced by seepage water. Soils which are permanently saturated due to poor drainage (usually caused by bedrock or till restriction) are included in the HK8 component.

SOIL PROFILE

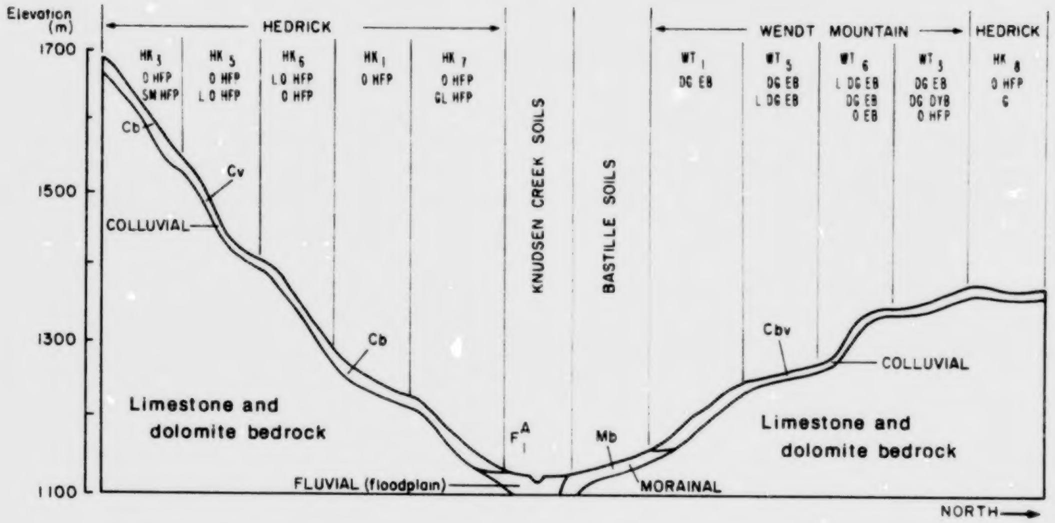
HK_1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - pinkish gray; sandy loam
- Bf - reddish brown; sandy loam
- Bm - dark yellowish brown; sandy loam
- BC - brown; loam
- C or Ck

Hedrick

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HK1	Orthic Humo-Ferric Podzol		Well	>50
HK3	Orthic Humo-Ferric Podzol		Well	>50
		Sombric Humo-Ferric Podzol	Well	>50
HK4	Orthic Humo-Ferric Podzol		Well	>50
		Podzolic Gray Luvisol; Brunisolic Gray Luvisol	Well	>50
HK5	Orthic Humo-Ferric Podzol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
HK6	Lithic Orthic Humo-Ferric Podzol		Well	<50
		Orthic Humo-Ferric Podzol	Well	>50
HK7	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleyed Humo-Ferric Podzol	Imperfectly	>50
HK8	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleysolic	Poorly	>50

HEDRICK AND WENDT MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
1700
1500
1300
1100
HEDRICK
HK3
O HFP
SM HFP
HK5
O HFP
L O HFP
HK6
L O HFP
O HFP
HK1
O HFP
HK7
O HFP
GL HFP
KNUDSEN CREEK SOILS
BASTILLE SOILS
WENDT MOUNTAIN
WT1
DG EB
WT5
DG EB
L DG EB
WT6
L DG EB
DG EB
O EB
WT3
DG EB
DG DYB
O HFP
HEDRICK
HK8
O HFP
G
Cb
Cv
COLLUVIAL
Cb
Limestone and dolomite bedrock
F A I
Mb
FLUVIAL (floodplain)
MORAINAL
Cbv
COLLUVIAL
Limestone and dolomite bedrock
NORTH

This association is often mapped in complexes with Bastille and Onion Creek soils. Wendt Mountain soils have developed on similar parent material, but differ from Hedrick soils in that they have Brunisolic rather than Podzolic soil development. Wendt Mountain soils generally occur in comparatively drier environments downslope or eastward of the Hedrick soils. Sheba Mountain soils occur upslope of the Hedrick soil association.

The Hedrick soil association is located within the Subalpine Engelmann Spruce - alpine fir zone dominantly in the Subboreal Region.

COMMENTS FOR LAND USE

Agriculture.	Very low capability. The subalpine climate, steep slopes, and excessive stoniness are major limitations for agricultural use.
Forestry.	Low capability. The short growing season limits capability.
Ungulates.	Low capability for moose. Excessive winter snow depth and the current stage of mature forest cover are the main limitations. Some habitat exists for goat and caribou. Forage capability during the early seral stages is variable (low to moderate) and depends upon soil depth and the soil moisture regime.
Recreation.	Moderate to very low carrying capacity. Slope determines the carrying capacity.
Engineering.	Severe limitations. The major limitation is due to steep slopes. Seepage sites and lithic soils also pose limitations.

HERRICK PASS SOIL ASSOCIATION (HP)

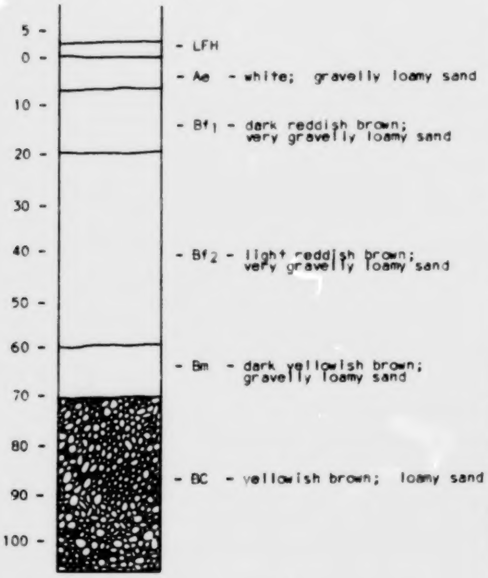
Herrick Pass soils occur mainly in the higher valleys along the Continental Divide in the Rocky Mountains. These soils are developed on fluvial and fluvioglacial materials which occur between 1400 and 2100 m elevation. The topography includes very gentle (2-5%) to moderate slopes (10-15%).

The textures range from very gravelly sand to loamy sand. Frequently, in the vicinity of ice ablation areas such as cirque floors, the soils will consist almost entirely of blocky quartzite gravels, cobbles and stones. The overall lithology consists dominantly of quartzites with minor inclusions of limestone, dolomite and shale clasts.

Most soils are rapidly drained, but inclusions of moderately well and imperfectly drained sites are common. Restricted drainage usually occurs due to bedrock as well as lenses of finer textures retarding downward percolation. The soils are extremely acid, very porous, and are generally rapidly to moderately pervious.

SOIL PROFILE

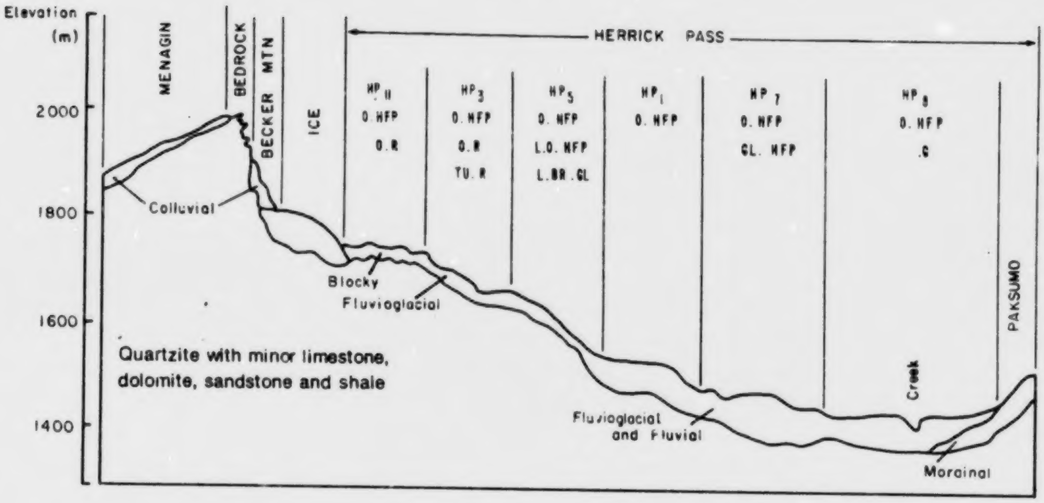
HP_1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH
- Ae - white; gravelly loamy sand
- Bf1 - dark reddish brown; very gravelly loamy sand
- Bf2 - light reddish brown; very gravelly loamy sand
- Bm - dark yellowish brown; gravelly loamy sand
- BC - yellowish brown; loamy sand

Herrick Pass

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HP1	Orthic Humo-Ferric Podzol		Rapid to Moderately Well	>100
HP3	Orthic Humo-Ferric Podzol		Rapid to Moderately Well	>50
		Orthic Regosol	Rapid to Moderately Well	>50
		Turbic Regosol	Rapid to Moderately Well	>50
HP5	Orthic Humo-Ferric Podzol		Rapid to Moderately Well	>50
		Lithic Brunisolic Gray Luvisol	Moderately Well	<50
		Lithic Humo-Ferric Podzol	Moderately Well	<50
HP7	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Gleyed Humo-Ferric Podzol	Imperfectly	>50
HP8	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Gleysolic	Poorly	>50
HP11	Orthic Humo-Ferric Podzol		Rapidly to Well	>100
		Orthic Regosol	Rapidly	>100

HERRICK PASS SOIL ASSOCIATION


Elevation (m)
2000
1800
1600
1400
MENAGIN
BEDROCK
BECKER MTN
ICE
HERRICK PASS
HP_{11}
O.HFP
O.R
HP_3
O.HFP
O.R
TU.R
HP_5
O.HFP
L.O.HFP
L.BR.GL
HP_1
O.HFP
HP_7
O.HFP
GL.HFP
HP_8
O.HFP
.G
PAKSUMO
Colluvial
Blocky
Fluvioglacial
Quartzite with minor limestone, dolomite, sandstone and shale
Creek
Fluvioglacial and Fluvial
Morainal

The modal soil development is Orthic Humo-Ferric Podzol (component HP1). Component HP3 occurs at the krummholz subzone. Here the soil development is often disrupted due to frost action and inclusions of Regosolic soils are common. Component HP5 is commonly mapped in areas where shallow to bedrock blocky quartzite stones and cobbles mantle cirque floors. Component HP7 includes soils which are subject to seepage and gleying. The HP8 component includes poorly drained areas, such as sedge meadows. These soils may contain up to 40 to 60 cm of fibrous peat at the surface. Component HP11 indicates a complex of Orthic Humo-Ferric Podzol and Orthic Regosol soil which occur on very rubbly and blocky materials located near ablating glaciers.

Herrick Pass soils occur in the Subalpine Engelmann spruce - alpine fir forest zone, dominantly in the Subboreal Region and to a lesser extent in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The subalpine climate and excessive stoniness are major limitations and preclude agriculture.
Forestry.	Very low capability. The short growing season limits the capability.
Ungulates.	Low to moderate capability for moose and caribou. Excessive winter snow depths limit the capability. Forage capability is generally low due to cold stony soils which usually have low moisture holding capacities.
Recreation.	Moderate carrying capacity. Slope and stoniness determine the carrying capacity.
Engineering.	Severe limitations. Frost action, bouldery terrain and inclusions of steep slopes pose major limitations. Some deposits may be suitable as aggregate sources.

HOLLIDAY SOIL ASSOCIATION (HL)

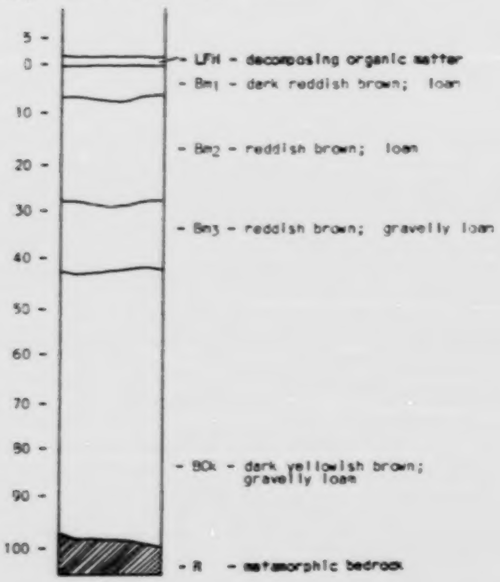
Holliday soils are located on the slopes of the Rocky Mountains south of the McGregor River and to a minor extent on the east flanks of the Cariboo Mountains. The soils have developed in colluvium which occurs from the valley floor to the krummholz subzone, an elevational range of 1000 to 1800 m. The topography varies from moderately to strongly sloping (10 to 30%) in areas where the colluvium is intermixed with glacial till and from very strongly to steeply sloping (30 to 100%) where bedrock is interpersed with the colluvium.

Shallow deposits of colluvium are derived dominantly from a mixture of coarse to fine-grained metamorphic and sedimentary rock detritus with a minor inclusion of till. This terrain is usually identified by steeper slopes and its proximity to bedrock outcrops. Soil textures range from loam to loamy sand and include 10 to 60%, angular gravels and cobbles. Deeper colluvium is derived dominantly from weathered and eroded till with lesser inclusions of bedrock derived material. These soils have a textural range from gravelly loam to gravelly silt loam. The overriding influence of calcareous bedrock is generally reflected in the lower solum by a mildly alkaline reactions of pH 7.4 to 7.8.

Holliday soils are loose, well aerated and well to moderately well drained. Soil water easily penetrates the porous solum and upon reaching bedrock or compact till flows laterally downslope. Long seepage slopes and moisture-receiving sites, common at the base of mountains, occur throughout all valleys of the study area. Interception of these wet zones during road construction should be treated immediately with proper drainage structures.

SOIL PROFILE

HL_1: Orthic Eutric Brunisol

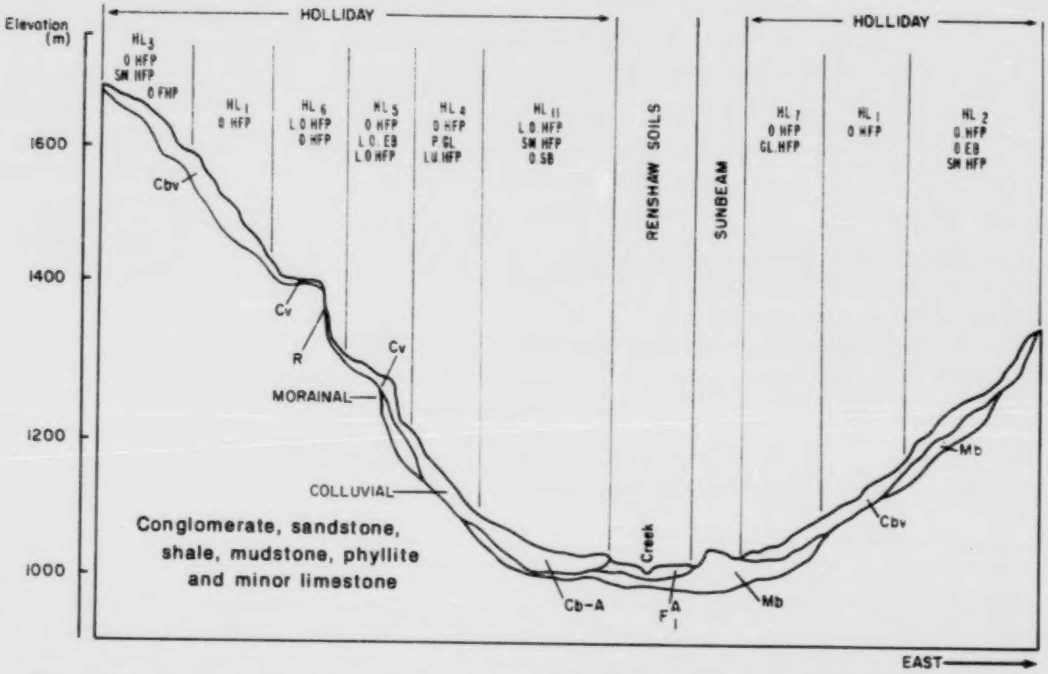


5
0
10
20
30
40
50
60
70
80
90
100
LFH - decomposing organic matter
Bm1 - dark reddish brown; loam
Bm2 - reddish brown; loam
Bm3 - reddish brown; gravelly loam
BCk - dark yellowish brown; gravelly loam
R - metamorphic bedrock

Holliday

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HL1	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
HL2	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Orthic Eutric Brunisol	Well to Moderately Well	>50
		Sombric Humo-Ferric Podzol	Well to Moderately Well	>50
HL3	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Sombric Humo-Ferric Podzol	Moderately Well	>50
		Orthic Ferro-Humic Podzol	Moderately Well	>50
HL4	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Podzolic Gray Luvisol	Moderately Well	>50
		Luvisolic Humo-Ferric Podzol	Moderately Well	>50
HL5	Orthic Humo-Ferric Podzol		Well to Moderately Well	50-100
		Lithic Orthic Eutric Brunisol	Well	<50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
HL6	Lithic Orthic Humo-Ferric Podzol		Well to Moderately Well	<50
		Orthic Humo-Ferric Podzol	Well to Moderately Well	>50
HL7	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleyed Humo-Ferric Podzol	Imperfectly	>50
HL11	Lithic Orthic Humo-Ferric Podzol		Moderately Well	<50
		Sombric Humo-Ferric Podzol	Moderately Well	50-100
		Orthic Sombric Brunisol	Moderately Well	50-100

HOLLIDAY SOIL ASSOCIATION


HOLLIDAY
HOLLIDAY
Elevation (m)
1600
1400
1200
1000
HL$_3$ O HFP SM HFP O FHP
HL$_1$ O HFP
HL$_6$ L O HFP O HFP
HL$_5$ O HFP L O EB L O HFP
HL$_4$ O HFP P GL LU HFP
HL$_{11}$ L O HFP SM HFP O SB
RENSHAW SOILS
SUNBEAM
HL$_7$ O HFP GL HFP
HL$_1$ O HFP
HL$_2$ O HFP O EB SM HFP
Cbv
Cv
R
Cv
MORAINAL
COLLUVIAL
Conglomerate, sandstone, shale, mudstone, phyllite and minor limestone
Creek
Cb-A
A
F$_1$
Mb
Cbv
Mb
EAST

The modal Holliday soil is an Orthic Humo-Ferric Podzol, as indicated by the HL1 component. The HL2 component is mapped on climatically drier south and southwest facing slopes where Douglas-fir occurs. At higher elevations the HL3 component identifies subalpine meadows and tree island landscapes which are climatically wetter and subject to high snowpacks. The HL4 component identifies soils developed from finer textured materials derived from mudflows, till or weathered siltstone. The HL5 component identifies areas containing inclusions of lithic soils, whereas HL6 identifies soils which are dominantly shallow to bedrock. Sites which are gleyed, due to seepage and moisture accumulation, are included in HL7. The HL11 component indicates soils subject to snow avalanching.

Holliday soils are frequently mapped in complexes with the Sunbeam soil association. The Wendle soil association which occurs at lower elevations in the interior western hemlock - western red cedar zone, has very similar soil properties to Holliday soils. Holliday soils are also generally similar to the Dezaiko and Captain Creek soils as mapped and described in the Barkerville Soil Survey Report (Lord, at press.). See Soil Name Correlation Guide 93I and 93H, Appendix G.

This association occurs in the Subalpine Engelmann spruce - alpine fir forest zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Subalpine climate, steep slopes and shallow soils are major limitations.
Forestry.	Low to moderate capability. The major limitation is a short growing season. Moisture deficits may occur on some sites.
Ungulates.	Low capability. Excessive snow depth and the present stages of mature forest cover limit use. The soils vary in forage capability during the early seral stages from low to high depending upon soil depth and the soil moisture regime.
Recreation.	Severe to moderate limitations. Steep slopes and shallow soils limit the diversity of recreational use.
Engineering.	Moderate to severe limitations. Steep slopes, shallow soil depths, seepage sites and potential frost action are the main limitations.

HOLTSLANDER SOIL ASSOCIATION (HO)

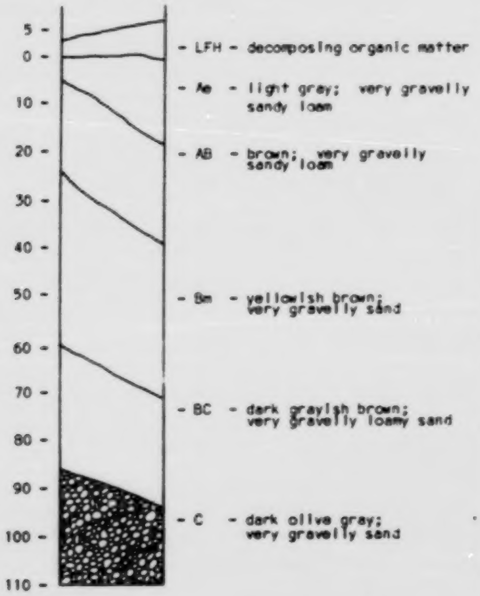
Holtslander soils occur in the Rocky Mountain Foothills usually on or near the valley floors and range in elevation from 1050 to 1650 m. The parent materials consist of mostly sandy loam to very gravelly loamy sand fluvial and fluvioglacial terraces, ridges and blankets. The lithology of these coarse materials is dominantly sandstone, conglomerate and shale with minor inclusions of limestone and dolomite clasts. Some deposits, particularly in areas of siltstone bedrock, consist of somewhat finer textures.

The topography is level to gently sloping (0-5%). Perviousness ranges from rapid to moderate and the soil is well to moderately well drained.

Soil development is dominantly Degraded Dystric Brunisol (component HO1). The HO2 component occurs in slightly drier environments where weathering has been less intense. On slightly higher and presumably older terraces, and where textures are somewhat finer (i.e. gravelly silt loam), minor areas of Brunisolic Gray Luvisol soil development occurs. These areas are mapped as the HO4 component. The HO5 component indicates soils which have inclusions of shallow to bedrock areas. Areas with imperfect drainage and Gleyed Degraded Dystric Brunisol development are included in the HO7 component. Component HO8 includes flat areas subject to poor drainage. These soils include Gleysolics which often have up to 60 cm of peat accumulation on the surface.

SOIL PROFILE

HO1; Degraded Dystric Brunisol

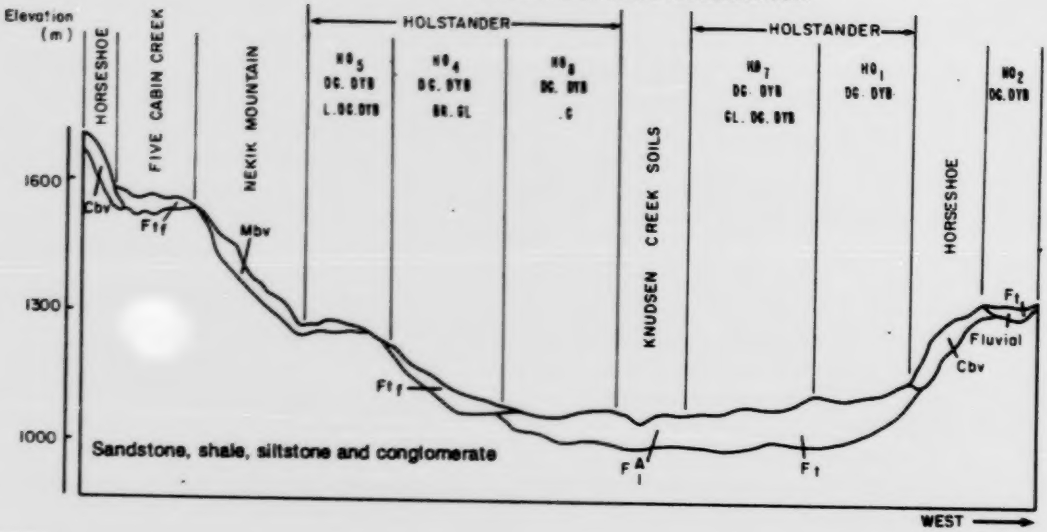


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - light grey; very gravelly sandy loam
- AB - brown; very gravelly sandy loam
- Bm - yellowish brown; very gravelly sand
- BC - dark grayish brown; very gravelly loamy sand
- C - dark olive gray; very gravelly sand

Holtslander

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HO1	Degraded Dystric Brunisol		Well	>100
HO2	Degraded Dystric Brunisol		Well	>100
		Degraded Eutric Brunisol	Well	>100
HO4	Degraded Dystric Brunisol		Well	>100
		Brunisolic Gray Luvisol	Well	>100
HO5	Degraded Dystric Brunisol		Well	>50
		Lithic Degraded Dystric Brunisol	Well	<50
HO7	Degraded Dystric Brunisol		Moderately Well	>100
		Gleyed Degraded Dystric Brunisol	Imperfectly	>100
HO8	Degraded Dystric Brunisol		Moderately Well	>100
		Gleysolic	Poorly	>100

HOLSTANDER SOIL ASSOCIATION


Elevation (m)
1600
1300
1000
HORSESHOE
FIVE CABIN CREEK
NEKIK MOUNTAIN
HOLSTANDER
HO5 DG. DYB L.DG.DYB
HO4 DG. DYB BR.GL
HO8 DG. DYB .C
KNUDSEN CREEK SOILS
HOLSTANDER
HO7 DG. DYB GL. DG. DYB
HO1 DG. DYB
HORSESHOE
HO2 DG.DYB
Cbv
Ftf
Mbv
Ftf
F A I
Ft
Ft
Fluvial
Cbv
Sandstone, shale, siltstone and conglomerate
WEST

Holtslander soils are often mapped in complexes with Nekik Mountain and Hambrock soil associations.

Holtslander soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture. Very low capability. The adverse subalpine climate, stoniness, and droughtiness are the major limitations. Some areas, following logging, may be suitable for grazing.

Forestry. Low capability. The short growing season and moisture deficiencies limit the capability.

Ungulates. Low capability for moose. Excessive winter snow depth and the current mature stage of forest cover are the main limitations. The capability for forage production ranges from low to moderate during the early seral stages. Droughtiness due to a lower moisture holding capacity is the main limitation.

Recreation. Very high to high carrying capacity. The soils are suitable for most recreational purposes.

Engineering. Slight limitations. Minor frost action and poorly drained sites are the major limiting factors. Some of the deposits may be suitable for aggregate extraction.

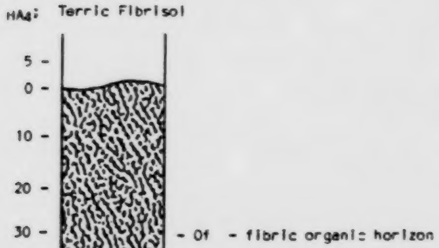
HOMINKA SOIL ASSOCIATION (HA)

Hominka soils occur in Rocky Mountains, Rocky Mountain Foothills and to a very minor extent in the Cariboo Mountains. The soils are developed in organic deposits on depressional, level or gently sloping topography (<5%) between the elevational limits of 1200 to 1800 m. The peat consists chiefly of relatively undecomposed mosses and sedges with minor inclusions of wood from shrubs and fallen trees. The deposits have originated and continue to develop in moisture-receiving sites and they are most commonly located in association with floodplain deposits. The soils are subject to a permanent water table which is usually within 25 cm of the soil surface. Periodic flooding is common. Hominka soils have a very low bearing capacity due to the high water content and low bulk density of the peat.

The middle tier is dominantly fibric and grades to mesic in the bottom tier; mesic textures normally occur near the mineral soil contact. The reaction of the soils varies from extremely acid to moderately alkaline; the alkaline pH occurs where the organic deposits are subject to calcium-rich seepage water emanating from zones of limestone bedrock.

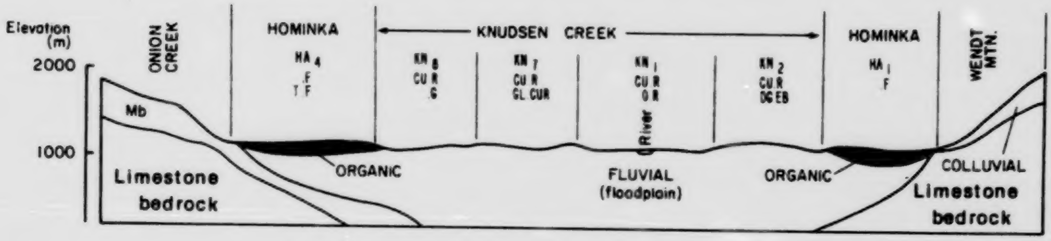
The dominant soil development is Typic Fibrisol (component HA1). The HA4 component has inclusions of Terric Fibrisols and Terric Mesisols where the depth of peat to mineral soil is relatively shallow.

SOIL PROFILE



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HA1	Typic Fibrisol		Very Poorly	>160
HA4	Typic Fibrisol		Very Poorly	>160
		Terric Fibrisol Terric Mesisol	Very Poorly	>40

HOMINKA AND KNUDSEN CREEK SOIL ASSOCIATIONS


Elevation (m)
2000
1000
ONION CREEK
HOMINKA
HA_4
.F
T F
KNUDSEN CREEK
KN_8
CU R
.G
KN_7
CU R
GL CUR
KN_1
CU R
O R
River
KN_2
CU R
DG EB
HOMINKA
HA_1
F
WENDT MTN.
Mb
Limestone bedrock
ORGANIC
FLUVIAL (floodplain)
ORGANIC
COLLUVIAL
Limestone bedrock

Hominka soils are similar to those described in the report "Biophysical Soil Resource and Land Evaluation of the Northeast Coal Study Area 1976-1977 Volume Two" (Vold et al., 1977).

This association occurs in the Subalpine Engelmann spruce - alpine fir forest zone of both the Interior Wet Belt and Subboreal Regions.

COMMENTS FOR LAND USE

Agriculture.	Very low capability. The subalpine climate, frequency of flooding and high water table precludes arable agriculture.
Forestry.	Very low capability. The very poor drainage is extremely limiting to forest growth.
Ungulates.	Low to moderate capability for moose. Forage quantity is the main limitation.
Recreation.	Very low carrying capacity. Very poor drainage, low bearing capacity and frequent flooding severely limits the carrying capacity.
Engineering.	Severe limitations. The very poor drainage and very low bearing strength of the peat are major limiting factors.

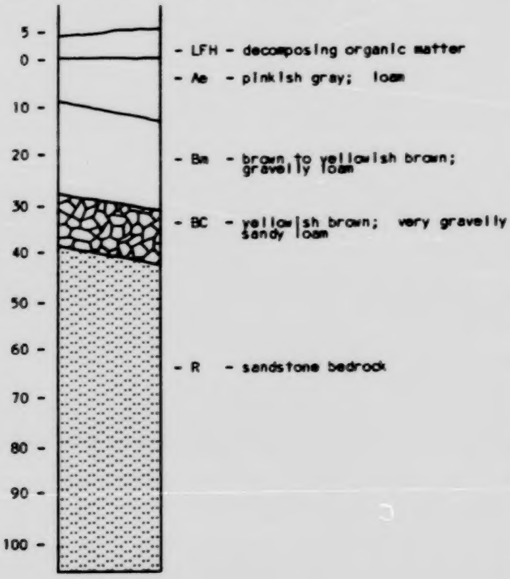
HORSESHOE SOIL ASSOCIATION (HS)

Horseshoe soils occur primarily in the Rocky Mountain Foothills between the elevations 1050 to 1900 m. They are derived from and generally overlie weathered sandstone, shale and occasionally conglomerate bedrock. The topography varies from strongly sloping (16-30%), to extremely sloping (46-70%). In the former case Horseshoe soils are usually mapped with Turning Mountain or Hambrook soils while in the latter they are either mapped alone or with bedrock.

The texture varies from very gravelly loamy sand to loam; on steeper slopes the soils frequently contain a substantial volume of angular cobbles and stones. The surface soil horizons, to approximately 50 cm depth, are very strongly acid, and the reaction of subsoil horizons varies with the underlying bedrock. Horseshoe soils have a loose porous matrix, are rapidly to moderately pervious and are generally well drained.

SOIL PROFILE

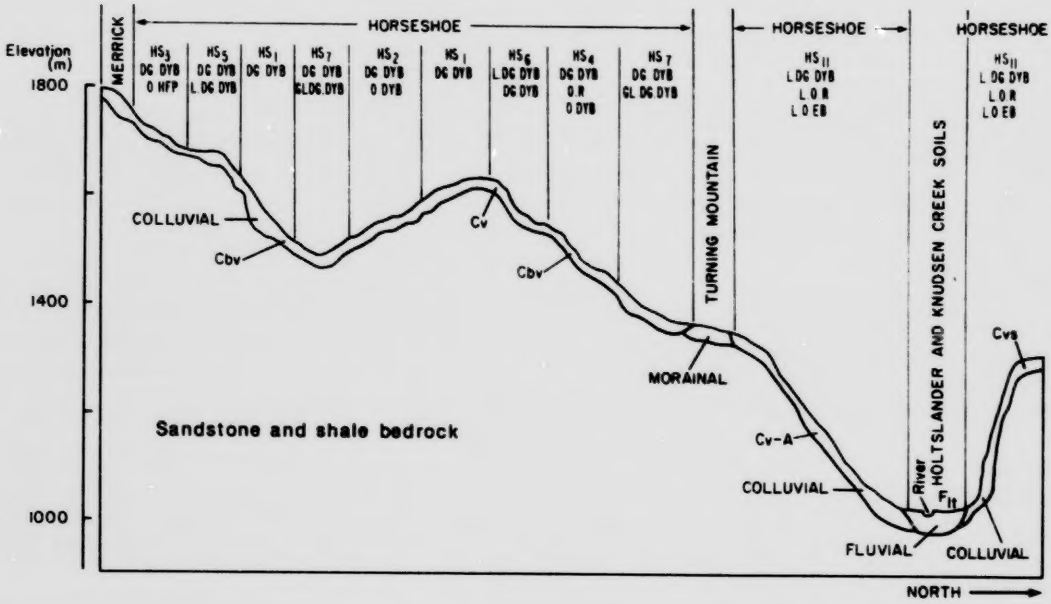
HS6: Lithic Degraded Dystric Brunisol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
- LFH - decomposing organic matter
- Ae - pinkish gray; loam
- Bm - brown to yellowish brown; gravelly loam
- BC - yellowish brown; very gravelly sandy loam
- R - sandstone bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
HS1	Degraded Dystric Brunisol		Well	>50
HS2	Degraded Dystric Brunisol		Well	>50
		Orthic Dystric Brunisol	Well	>50
HS3	Degraded Dystric Brunisol		Well	>50
		Orthic Humo-Ferric Podzol	Well	>50
HS4	Degraded Dystric Brunisol		Well	>50
		Orthic Regosol; Orthic Dystric Brunisol	Well	>50
HS5	Degraded Dystric Brunisol		Well	>50
		Lithic Degraded Dystric Brunisol	Well	<50
HS6	Lithic Degraded Dystric Brunisol		Well	<50
		Degraded Dystric Brunisol	Well	>50
HS7	Degraded Dystric Brunisol		Well	>50
		Gleyed Degraded Dystric Brunisol	Imperfectly	>50
HS11	Lithic Degraded Dystric Brunisol	Lithic Orthic Regosol; Lithic Orthic Eutric Brunisol	Well to Rapidly	<50

Horseshoe

HORSESHOE SOIL ASSOCIATION


Elevation (m)
1800
1400
1000
MERRICK
HORSESHOE
HS3 DG DYB O HFP
HS5 DG DYB L DG DYB
HS1 DG DYB
HS7 DG DYB GL DG DYB
HS2 DG DYB O DYB
HS1 DG DYB
HS6 L DG DYB DG DYB
HS4 DG DYB O R O DYB
HS7 DG DYB GL DG DYB
TURNING MOUNTAIN
HORSESHOE
HS11 L DG DYB L O R L O EB
HOLTSLANDER AND KNUDSEN CREEK SOILS
HORSESHOE
HS11 L DG DYB L O R L O EB
COLLUVIAL
Cbv
Cv
Cbv
MORAINAL
Sandstone and shale bedrock
Cv-A
COLLUVIAL
River
Flt
Cvs
FLUVIAL
COLLUVIAL
NORTH

The modal soil development for the Horseshoe association is Degraded Dystric Brunisol. On drier, south facing slopes Orthic Dystric Brunisols commonly occur and are included in the HS2 component. The HS3 component occurs in wetter and colder environments adjacent to the krummholz subzone; here inclusions of Orthic Humo-Ferric Podzols are common. Some of the coarser textured soils in the association have only weakly developed horizons due to soil creep and these are included in the HS4 component. The HS5 and HS6 components respectively contain minor and dominant properties of Lithic Degraded Dystric Brunisols. The HS7 component is commonly mapped at the base of slopes and include areas which are subject to seepage. The HS11 component occurs on steeper slopes which are currently subject to severe erosional processes; consequently inclusions of soils which lack development are common.

Horseshoe soils are found in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Subalpine climate and steep slopes are the major limitations. A very limited potential for grazing exists on some selected areas.
Forestry.	Low capability. A short growing season and potential moisture deficits limit the capability.
Ungulates.	Low capability for moose. Low forage quantity due to the current mature stage of forest cover and excessive winter snow depths are the main limitations. Some habitat exists for goat and caribou. Depending upon soil depth and moisture regime the soils have a moderate to low forage capability during the early seral stages.
Recreation.	Moderate to very low carrying capacity. The carrying capacity is largely limited by the steepness of slope. Soils subject to seepage and creep also pose limitations.
Engineering.	Severe limitations. Steep slopes, loose erodible soils and areas of shallow soils all pose limitations.

KNUDSEN CREEK SOIL ASSOCIATION (KN)*

Knudsen Creek soils occur in the Rocky Mountains and Rocky Mountain Foothills usually on the east side of the Continental Divide. These soils occur on depressional to very gently sloping (0.5 to 5%) floodplain materials between the elevations of 1050 to 1650 m. A majority of the deposits are subject to seasonal flooding.

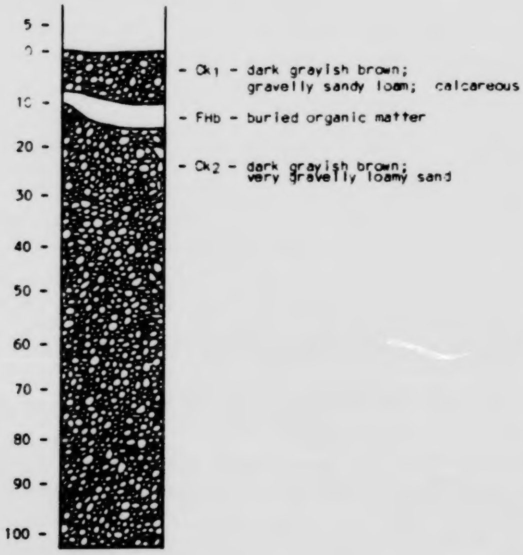
The soils are usually calcareous throughout and textures vary widely with depth, depending upon the nature of fluvial stratigraphy and deposition. Usually the surface textures, to a depth of one metre, range from sandy loam to very gravelly loamy sand; gravelly sands can be expected at depth. The soils are usually moist throughout the growing season and are moderately pervious, moderately well drained, well aerated and easily penetrated by roots.

The modal soil has Cumulic Regosol soil development with minor inclusions of Orthic Regosol. The KN2 component occurs on slightly drier raised terraces that have been flood free sufficiently long to develop Brunisolic soils in some areas. The KN7 component indicates inclusions of very moist Gleyed Regosols. The KN8 component indicates areas with substantial inclusions of poor drainage which result in saturated Gleysolic soils.

Knudsen Creek soils are mapped in association with Five Cabin Creek and Holtslander soils which occur on the higher (drier), adjacent gravelly terraces.

SOIL PROFILE

KN1; Cumulic Regosol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40
50
60
70
80
90
100
Ck1 - dark grayish brown; gravelly sandy loam; calcareous
FHb - buried organic matter
Ck2 - dark grayish brown; very gravelly loamy sand

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
KN1	Cumulic Regosol		Moderately Well	>100
KN2	Cumulic Regosol		Moderately Well	>100
		Degraded Eutric Brunisol	Well	>100
KN7	Cumulic Regosol		Moderately Well	>100
		Gleyed Cumulic Regosol	Imperfectly	>100
KN8	Cumulic Regosol		Moderately Well	>100
		Gleysolic	Poorly	>100

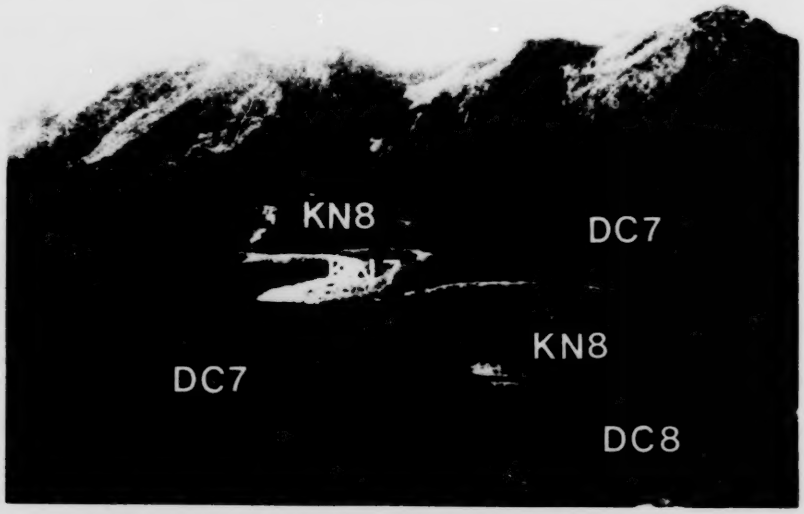


PLATE 3.3 KNUDSEN CREEK SOIL ASSOCIATION

Knudsen Creek soils are subject to flooding. They include a wide variety of soil moisture conditions and soil textures. The Dudzic soils on lacustrine are often located upslope from Knudsen Creek soils.

Knudsen Creek soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region. Willow, alder and vaccinium are common shrubs. Lodgepole pine also occurs, especially in fire disclimax communities.

* Refer to Hominka Association for cross-sectional diagram.

COMMENTS FOR LAND USE

Agriculture.	Very low capability. Subalpine climate, flooding and inclusions of excessive stoniness are the major limitations. Limited potential exists for grazing.
Forestry.	Low capability. Frequent flooding coupled with the short growing season lowers the capability of these soils.
Ungulates.	Low to moderate capability for moose. Excessive snow depth and limited forage quantity due to the current mature forest cover are the main limitations. These soils have good potential for responding to wildlife management techniques designed to increase forage production. Capability could range from high to very high.
Recreation.	Low carrying capacity. Flooding is a hazard to most recreational uses and installations.
Engineering.	Severe limitations. Flood occurrence, high water tables and erosion potential are the major limiting factors.

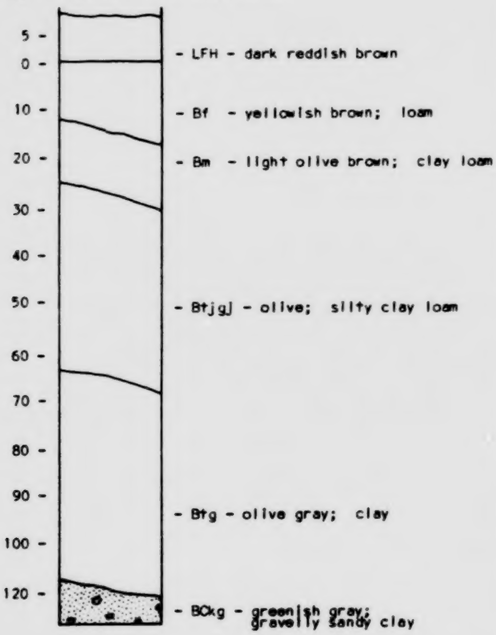
LANEZI SOIL ASSOCIATION (LZ)

Lanezi soils occur in the western portion of the study area, mainly in the Rocky Mountain Trench and to a lesser extent in the Rocky Mountains and McGregor Plateau. Elevations range from 730 to 1440 m. These soils have developed on rolling and drumlinized till in the Rocky Mountain Trench, and on gentle to moderate slopes in the adjacent valleys of the Morkill, Torpy and McGregor rivers. Soil textures range from sandy clay loam to gravelly loam; coarse fragment content varies from 15 to 30% by volume.

Soil drainage varies from moderately well drained on moderate slope positions to imperfectly on poorly drained on level and depressional sites. Throughout the upper solum, soil permeability and aeration ranges from moderate to low. Below 50 cm depth, soil aeration and drainage is severely restricted due to a zone of clay accumulation coupled with relatively impermeable, compact basal till. Evidence of impeded drainage is manifested by mottles and gleying throughout the lower solums. The soils are often calcareous at >100 cm depth, and extremely acid throughout the upper solum.

SOIL PROFILE

LZ7; Gleyed Podzolic Gray Luvisol


5 -
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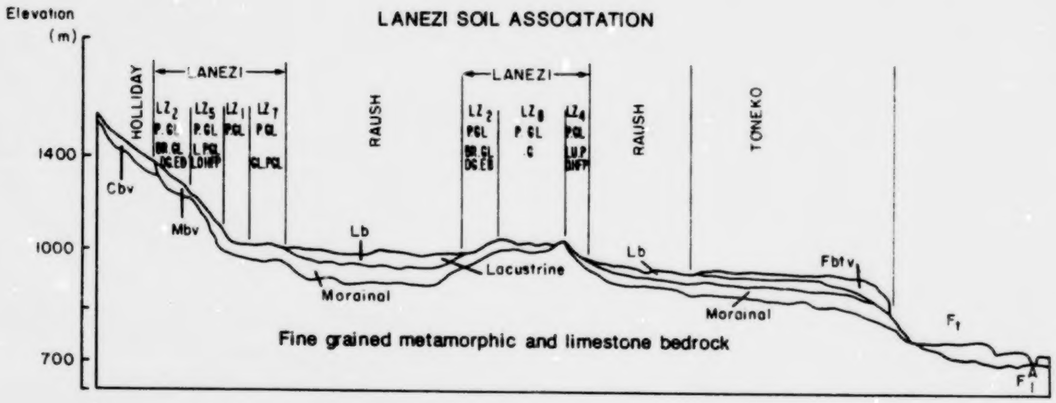
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
120 -
- LFH - dark reddish brown
- Bf - yellowish brown; loam
- Bm - light olive brown; clay loam
- Btjgj - olive; silty clay loam
- Btg - olive gray; clay
- BCkg - greenish gray; gravelly sandy clay

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
LZ1	Podzolic Gray Luvisol		Moderately Well	>50
LZ2	Podzolic Gray Luvisol		Moderately Well	>50
		Brunisolic Gray Luvisol	Moderately Well	>50
		Degraded Eutric Brunisol	Moderately Well	>50
LZ4	Podzolic Gray Luvisol		Moderately Well	>50
		Luvisolic Humo-Ferric Podzol	Moderately Well	>50
		Orthic Humo-Ferric Podzol	Moderately Well	>50
LZ5	Podzolic Gray Luvisol		Moderately Well	>50
		Lithic Podzolic Gray Luvisol	Moderately Well	<50
		Lithic Orthic Humo-Ferric Podzol	Moderately Well	<50
LZ7	Podzolic Gray Luvisol		Moderately Well	>50
		Gleyed Podzolic Gray Luvisol	Imperfectly	>50
LZ8	Podzolic Gray Luvisol		Moderately Well	>50
		Gleysolic	Poorly	>50



LANEZI SOIL ASSOCITATION

Elevation (m)
1400
1000
700
HOLLIDAY
LANEZI
LZ2 P.GL BR.GL DG.ED
LZ5 P.GL L.PGL LDIHFP
LZ1 PGL
LZ7 PGL GL.PGL
RAUSH
LANEZI
LZ2 PGL BR.GL DG.EB
LZ8 P.GL C
LZ4 PGL LU.P DHFP
RAUSH
TONEKO
Cbv
Mbv
Lb
Lacustrine
Morainal
Lb
Fbtv
Morainal
Ft
A
Ft
Fine grained metamorphic and limestone bedrock

Lanezi soils are dominantly Podzolic Gray Luvisol (component LZ1). The LZ2 component includes climatically drier south and west facing slopes where stands of Douglas-fir are common. Soils consisting of modified or coarser textured surface horizons, such as old beach strands, are identified in component LZ4. Inclusions of lithic soils are mapped as the LZ5 component. Areas of imperfect drainage are very common and are recognized in the LZ7 component. Depressional sites with poor drainage form part of LZ8. These poorly drained Gleysolic soils often have peaty surface horizons up to 60 cm in depth.

Lanezi soils occur dominantly in the interior western hemlock - western red cedar zone and subdominantly in the interior western red cedar - white spruce zone of the Interior Wet Belt Region.

COMMENTS FOR LAND USE

Agriculture. Moderate to low capability. A moderately short frost-free period, dense soils, inclusions of soils with restricted drainage and stoniness are the major limitations.

Forestry. Moderate capability. A combination of cool soils, dense subsoils and climate moderate forest growth.

Ungulates. Low to moderate capability for moose. The current mature stages of forest succession which limits browse species as well as excessive winter snow depths pose moderate limitations to ungulate use. The moist, medium textured soils have a moderate to high capability for forage production during early seral stages.

Recreation. Moderate carrying capacity. Some limitations exist due to the tendancy of fine textures to compact under heavy use, thereby causing deterioration in drainage.

Engineering. Moderate to slight limitations. Potential frost action, inclusions of seepage or moisture accumulation zones, and potential surface erosion pose some limitations to engineering.

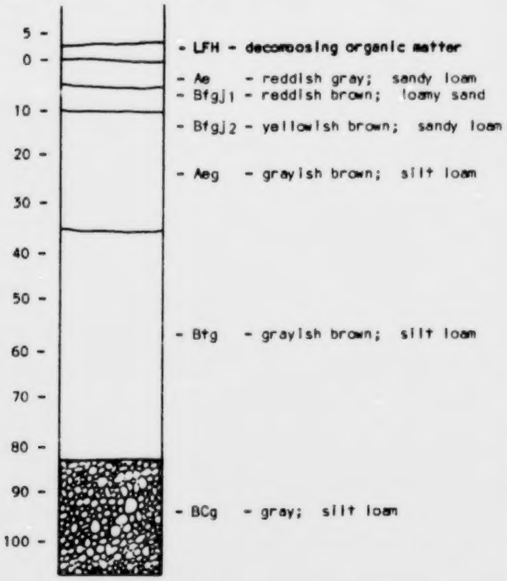
LONGWORTH SOIL ASSOCIATION (LO)

Longworth soils occur in the Rocky Mountain Trench and have developed on noncalcareous sandy terraces of the Fraser River. The elevational range of these soils lies between 655 m and 750 m, which places the terraces at approximately 10 to 100 m above the Fraser River. The lowest terraces located adjacent to the Guilford association are subject to a fluctuating water table which occurs at approximately 100 cm depth. The textural range of these deposits varies stratigraphically from stone-free loamy sand to silt loam depending upon the nature of fluvial deposition. Sandy loam however is the usual surface texture. Topography varies from nearly level to gently sloping (0-5%) and is often dissected by entrenched erosion channels and stream courses.

Longworth soils are usually well to moderately well drained with extensive imperfectly drained inclusions occurring in the hollows and on the lower terraces. The soils have moderately rapid internal drainage and moderate to low water-holding capacity; air, moisture, and plant roots penetrate the soils easily. They are very strongly acid, moderately low in plant nutrients, and have a medium organic matter content.

SOIL PROFILE

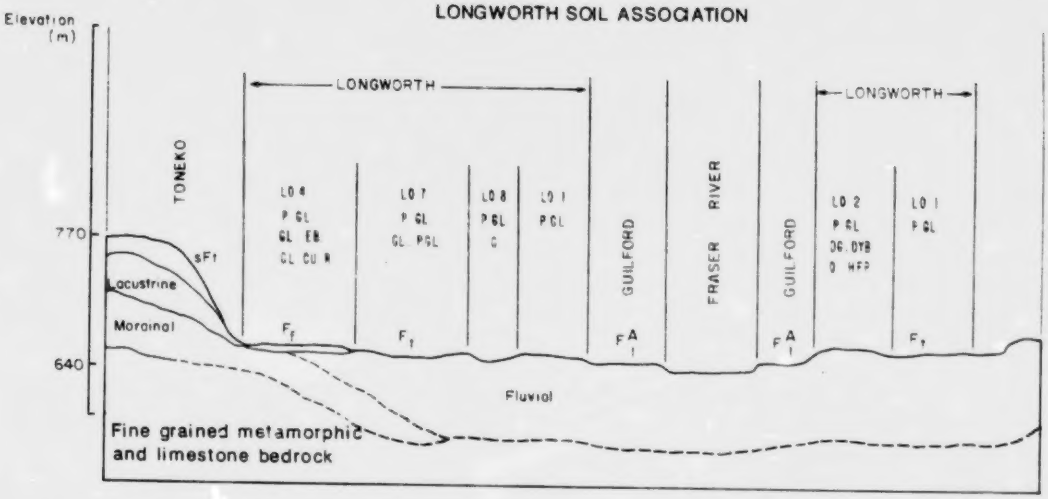
L07: Gleyed Podzolic Gray Luvisol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
- LFH - decomposing organic matter
- Ae - reddish gray; sandy loam
- Bfgj1 - reddish brown; loamy sand
- Bfgj2 - yellowish brown; sandy loam
- Aeg - grayish brown; silt loam
- Btg - grayish brown; silt loam
- BCg - gray; silt loam

Longworth

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
L01	Podzolic Gray Luvisol		Moderately Well	>100
L02	Podzolic Gray Luvisol		Moderately Well	>100
		Degraded Dystric Brunisol	Well	>100
		Orthic Humo-Ferric Podzol	Well	>100
L04	Podzolic Gray Luvisol		Moderately Well	>100
		Gleyed Eutric Brunisol	Imperfectly	>100
		Gleyed Cumulic Regosol	Imperfectly	>100
L07	Podzolic Gray Luvisol		Moderately	>100
		Gleyed Podzolic Gray Luvisol	Imperfectly	>100
L08	Podzolic Gray Luvisol		Moderately Well	>100
		Gleysolic	Poorly	>100

LONGWORTH SOIL ASSOCIATION



Longworth soil development is dominantly Podzolic Grey Luvisol (component LO1). The texture of the LO1 surface horizon is dominantly sandy loam to a general depth of 15 to 30 cm; below this depth the texture usually ranges from a loam to silt loam. This is attributed to the depositional nature of the sediments and the soil weathering processes which cause clay accumulation in the lower solum. Soils having coarser textures throughout the solum and lacking a zone of clay accumulation are classified as Degraded Dystric Brunisols or Orthic Humo-Ferric Podzols; these soils are identified in component LO2. The LO4 component includes Gleyed Eutric Brunisols and Gleyed Cumulic Regosols. These soils are developed in low gradient, fluvial fan materials which emanate from the adjacent lacustrine escarpments, and are subject to seepage. The commonly occurring LO7 component includes soils subject to fluctuating water tables, due mainly to the influence of lateral seepage. Soils subject to permanently saturated soil conditions and which often have a peaty surface horizon of up to 60 cm thick are classified as Gleysolics and are included in component LO8.

This association is similar to the Longworth series as mapped and described in Report No. 10, "Soils of the Upper Part of the Fraser Valley" (Hortie et al., 1970).

The Longworth association occurs mainly in the interior western red cedar - white spruce zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Moderate capability. Inclusions of soils subject to high water tables and a growing season restricted by a short freeze-free period are the major limitations.
Forestry.	High capability for black cottonwood and white spruce.
Ungulates.	Moderate to high capability for moose. Use depends upon the history of forestry and agricultural modifications to the vegetation composition. These soils have a good potential for responding to wildlife management techniques designed to increase forage production. Capability could range from high to very high on the edaphic sites.
Recreation.	Slight to moderate limitations. The main limitation to use is soil drainage. Imperfectly drained soils are prone to erosion and compaction under intensive use.
Engineering.	Severe to moderate limitations. Frost action, soil drainage, and soil conditions such as a high water tables coupled with a relatively high silt content, pose limitations for use as subgrade.

McGREGOR SOIL ASSOCIATION (MG)

McGregor soils occur in the Rocky Mountains on the west side of the in Continental Divide, below 1100 m elevation. These soils are mainly located on the silty sand floodplain deposits of the lower Herrick and Jarvis creeks. Seasonal fluvial deposition sometimes results in litter buried between stratas of silt loam to sandy loam textures. The fluvial materials have a 5 to 20% coarse fragment content and may either be non-calcareous or calcareous, depending upon the type of bedrock in a particular drainage.

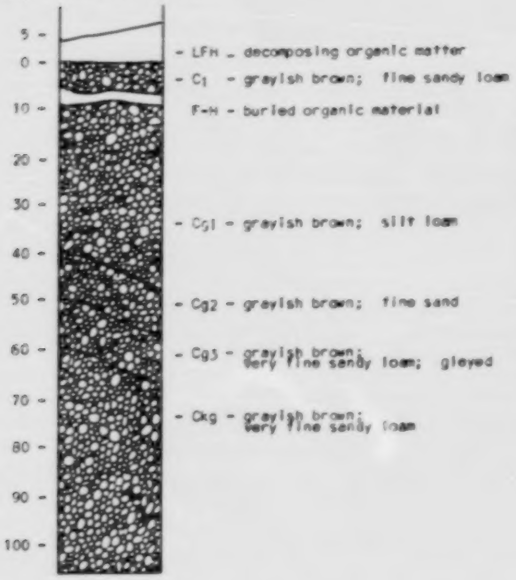
The McGregor soils are often inundated during periods of flood or high water; a fluctuating water table is generally found to within 2 m of the soil's surface. The topography is gently sloping (2-6%), with common inclusions of depressional sites.

The soils are neutral to mildly alkaline, moderately high in organic matter content and usually have a relatively high nutrient status. They are generally imperfectly drained. During the growing season moisture, air and plant roots penetrate the soil easily. Runoff is low, internal drainage is moderately rapid, and the moisture holding capacity ranges from low to moderate.

The dominant soil development is a Gleyed Orthic Regosol with substantial inclusions of Gleyed Cumulic Regosol (component MG1). These soils are gleyed in the subsoil and imperfectly drained due to the seasonally high water table. The MG8 component includes Gleyed Orthic Regosol and Rego Gleysol soil development which commonly occurs in wet depressional sites, such as oxbows and meander scars. This component is often mapped in complexes with organic soils, such as the Chief and Moxley soil associations.

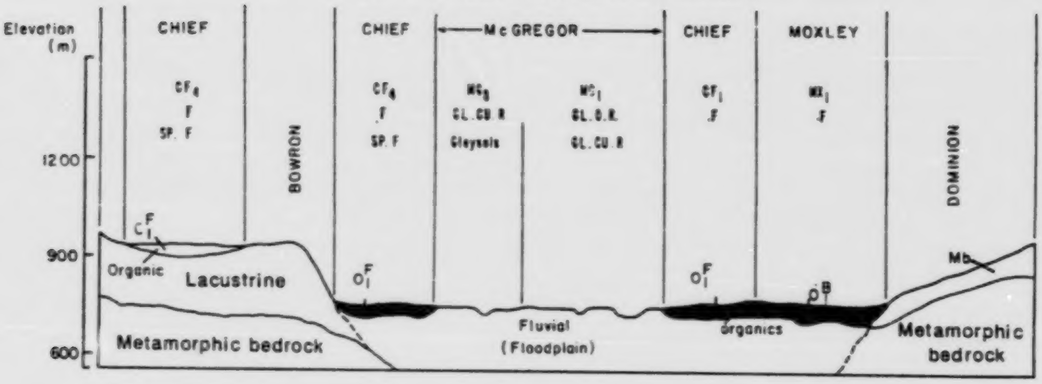
SOIL PROFILE

MG_1: Gleyed Orthic Regosol


5
0
10
20
30
40
50
60
70
80
90
100
LFH _ decomposing organic matter
C_1 - grayish brown; fine sandy loam
F-H - buried organic material
Cg1 - grayish brown; silt loam
Cg2 - grayish brown; fine sand
Cg3 - grayish brown; very fine sandy loam; gleyed
Ckg - grayish brown; very fine sandy loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
MG1	Gleyed Orthic Regosol		Imperfectly	>100
		Gleyed Cumulic Regosol	Imperfectly	>100
MG8	Gleyed Orthic Regosol		Imperfectly	>100
		Rego Gleysol	Poorly	>100

MOXLEY, CHIEF AND McGREGOR SOIL ASSOCIATIONS


Elevation (m)
1200
900
600
CHIEF
CF4
F
SP. F
BOWRON
CHIEF
CF4
F
SP. F
McGREGOR
MG3
GL.CU.R
Gleysols
MG1
GL.O.R
GL.CU.R
CHIEF
CF1
F
MOXLEY
MX1
F
DOMINION
C1F
Organic
Lacustrine
Metamorphic bedrock
O1F
Fluvial
(Floodplain)
O1F
OB
organics
Mb
Metamorphic
bedrock

The McGregor association, as described herein, is similar to that described in the report "Biophysical Soil Resources and Land Evaluation of the northeast coal study area, 1976-1977. Volume Two" (Vold et al., 1977), except that calcareous as well as non-calcareous soils are included. The McGregor soil series described in "Soils of the Upper Part of the Fraser Valley" (Hortie et al., 1970), is also very similar in its physical and chemical characteristics, but is restriected to the Rocky Mountain Trench, a slightly warmer climatic zone, as compared to the Rocky Mountain region.

The McGregor soil association in this report, is restricted to the Subboreal white spruce - alpine fir zone: common paper birch subzone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Moderate to low capability. Flooding, excess moisture, and the incidence of late spring frosts are the major limitations.
Forestry.	High capability. The capability for black cottonwood is high. Poorly drained areas have very low capability for spruce.
Ungulates.	High capability for moose. Excessive snow depth is a major limitation for other ungulates. The soils have a high capability for browse species production during the early seral stages.
Recreation.	Low carrying capacity. A flooding hazard exists for these soils.
Engineering.	Severe limitations. Seasonal flooding and poor drainage which contribute to a low bearing capacity, potential surface erosion, and frost action all impose some limits to engineering uses.

MENAGIN SOIL ASSOCIATION (MN)*

Menagin soils occur in the Rocky Mountains along the Continental Divide at high elevations, generally above 1600 m. They are most common along the height of land between Kakwa Lake and Wapiti Pass. These soils have developed above tree line on shallow rubbly colluvium which is derived from and generally overlies quartzite with minor inclusions of limestone, dolomite, sandstone and shale bedrock. The soils are subject to periglacial processes such as cryoturbation, nivation and solifluction. Soil textures are normally gravelly sandy loam to very gravelly loamy sand.

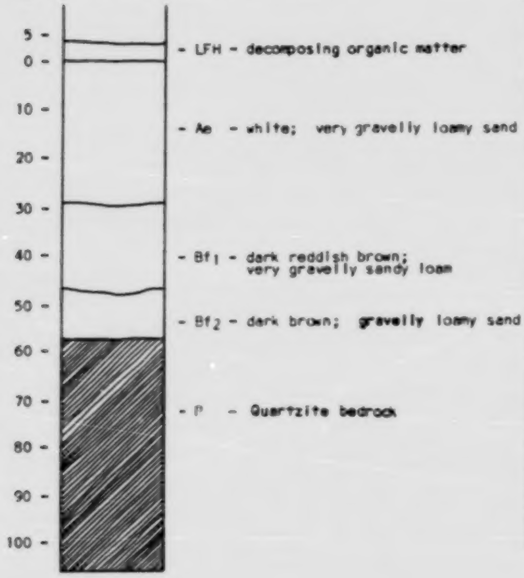
The topography ranges from very gentle (6 to 9%) to strong slopes (16 to 30%). The landscape consists of a wide variety of micro and meso sites very common to alpine environments. The soils are normally well drained, moderately to rapidly pervious, and usually extremely acid.

Soils in component MN1 contain no distinct soil horizonation due to frost heaving and mixing; here Orthic Regosols dominate. Component MN2 occurs just above tree line and includes soils subject to less intense frost action which allows podzolic soil horizons to develop. The MN3 component occurs on wind swept ridges where lithic soils and periglacial processes are very prevalent. Soils containing large volumes of blocky gravels, cobbles and stones commonly occur on cirque floors and near bedrock escarpments, these are included in the the MN4 component.

Menagin soils are located in the Alpine Tundra zone of the Subboreal Region.

SOIL PROFILE

MN2: Lithic Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - white; very gravelly loamy sand
- Bf1 - dark reddish brown; very gravelly sandy loam
- Bf2 - dark brown; gravelly loamy sand
- R - Quartzite bedrock

Menagin

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
MN1	Orthic Regosol		Well to Rapidly	>50
MN2	Orthic Regosol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Moderately Well	<50
		Orthic Humo-Ferric Podzol	Well	>50
MN3	Orthic Regosol		Rapidly	>50
		Lithic Turbic Regosol	Well	<50
MN4	Orthic Regosol		Rapidly	>50
		Lithic Humo-Ferric Podzol	Well	<50
		Lithic Orthic Regosol	Well	<50

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*Refer to Bastille Association for cross-sectional diagram.

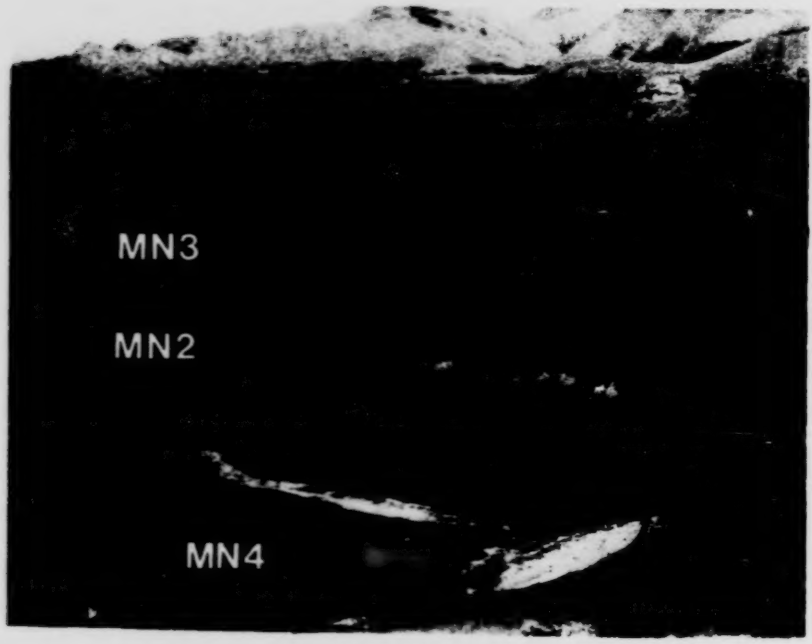


PLATE 3.4 MENAGIN SOIL ASSOCIATION (MN)

Menagin soils are mainly developed in blocky quartzite colluvium. They are extremely acid and in some locations podzolic (Bf) horizons occur below 50cm of a white leached surface horizon (Ae). (Photo by R. Maxwell)

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse alpine climate and the gravelly, coarse textures preclude agricultural use.
Forestry.	Very low capability. Alpine climate prevents tree growth.
Ungulates.	Low capability for caribou and goat. Low forage production due to a dominance of cold, droughty, rubbly soil. Excessive snow depths also limit use.
Recreation.	Low carrying capacity. Periglacial (cold climate) processes and areas of steep slopes limit the recreational uses of these soils.
Engineering.	Severe limitations. Frost action, shallowness to bedrock and steepness of slope are the main limitations.

MERRICK SOIL ASSOCIATION (MC)

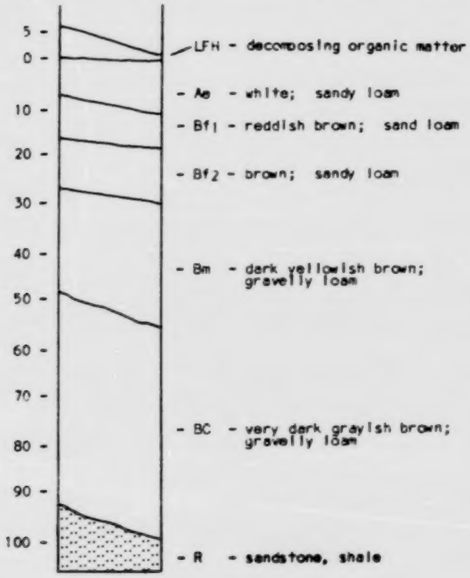
Merrick soils occur mainly in the Rocky Mountain Foothills and to a minor extent in the Rocky Mountains between the elevations of 1050 and 1900 m. The colluvium is derived from and generally overlies weathered sandstone, shale and occasionally conglomerate and limestone bedrock.

The topography varies from strong slopes (16-30%) to extreme slopes (46-70%). The texture varies from very gravelly loamy sand to sandy loam or sometimes loam. Frequently, on steeper slopes in the vicinity of bedrock exposures, the soils contain a substantial volume of angular cobbles and stones. The surface soil horizons, to approximately 50 cm depth, are extremely acid and podzolized; the reaction of subsoil horizons varies with the underlying bedrock; if the bedrock is calcareous then the subsoil is also likely calcareous. Merrick soils have a loose porous matrix, are rapidly to moderately pervious and are generally well drained.

The modal soil development for the Merrick association is Orthic Humo-Ferric Podzol. The MC3 component occurs in wetter and colder environments adjacent to the krummholz subzone where the accumulation of organic matter in the surface soil horizons has led to the development of some Sombric Humo-Ferric Podzols and Sombric Ferro-Humic Podzols. Soils with a dominance of lithic contacts are mapped as the MC6 component. Component MC11 indicates shallow soils in complex with eroding scree slopes; this component is subject to minor gullying and snow avalanching.

SOIL PROFILE

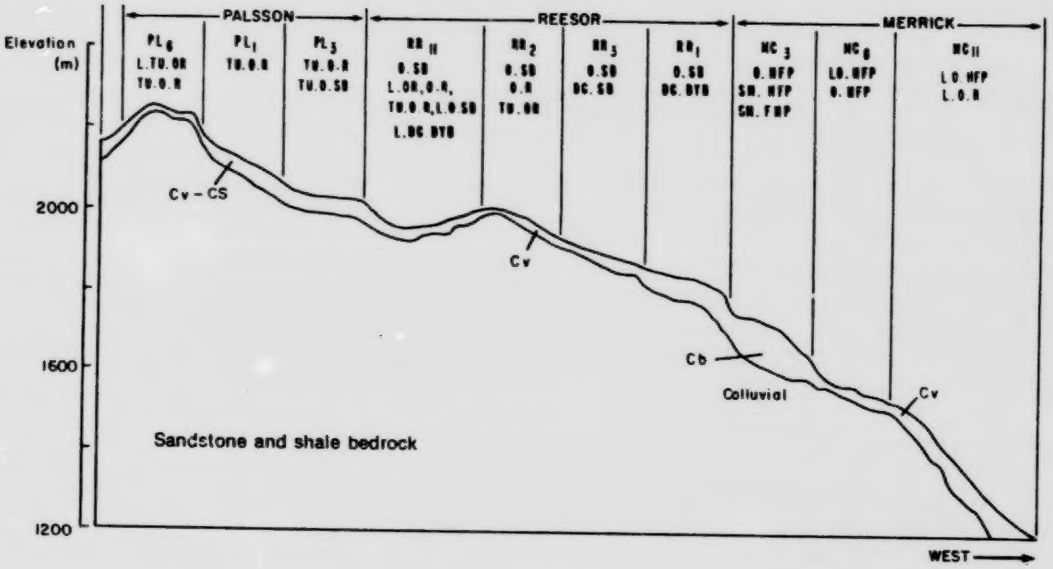
MC$_1$: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
LFH - decomposing organic matter
Ae - white; sandy loam
Bf1 - reddish brown; sand loam
Bf2 - brown; sandy loam
Bm - dark yellowish brown; gravelly loam
BC - very dark grayish brown; gravelly loam
R - sandstone, shale

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
MC3	Orthic Humo-Ferric Podzol		Well	>50
		Sombric Humo-Ferric Podzol	Well	>50
		Sombric Ferro-Humic Podzol	Well	>50
MC6	Lithic Orthic Humo-Ferric Podzol		Well	10-50
		Orthic Humo-Ferric Podzol	Well	>50
MC11*	Lithic Orthic Humo-Ferric Podzol		Well	10-50
		Lithic Orthic Regosol	Rapidly	10-50

*Subject to minor gullying and snow avalanching.

PALSSON, REESOR AND MERRICK SOIL ASSOCIATIONS


PALSSON
REESOR
MERRICK
Elevation (m)
PL6
L.TU.OR
TU.O.R
PL1
TU.O.R
PL3
TU.O.R
TU.O.SB
RR11
O.SB
L.OR,O.R,
TU.O.R,L.O.SB
L.DG.DYB
RR2
O.SB
O.R
TU.OR
RR3
O.SB
DG.SB
RR1
O.SB
DG.DYB
MC3
O.HFP
SM.HFP
SM.FHP
MC8
LO.HFP
O.HFP
MC11
LO.HFP
L.O.R
Cv - CS
2000
Cv
1600
Cb
Colluvial
Cv
Sandstone and shale bedrock
1200
WEST

The physical properties of Merrick soils are similar to the slightly less weathered Horseshoe soils. Merrick soils usually occur at higher elevations and on north and west facing aspects where podzolization processes are more prevalent.

Merrick soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse subalpine climate, steep topography, and excessive stoniness preclude agricultural uses.
Forestry.	Low capability. A short growing season, inclusions of shallow rubbly soils, and moisture deficiencies all limit tree growth.
Ungulates.	Low capability for moose. Medium to coarse textured soils with low moisture holding capacity pose limitations to forage growth. Excessive winter snow depths are also restrictive. Habitat exists for goat and caribou.
Recreation.	Moderate to very low carrying capacity. Steep slopes and inclusions of erodible shallow soils impose limits on the carrying capacity.
Engineering.	Severe limitations. Steep slopes, shallowness to bedrock and inclusions of soils prone to failure pose limitations for engineering.

MINNES SOIL ASSOCATION (MI)

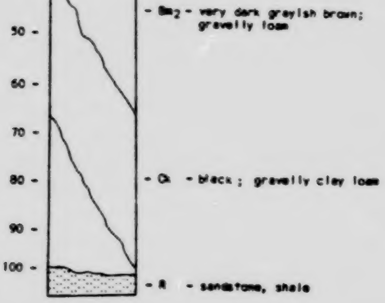
The Minnes soil association occurs in the Rocky Mountain Foothills southeast of the Narraway River. The soils are developed on colluvium derived from Jurassic and Cretaceous sediments known as the Minnes Group. This group includes fine-grained sandstone, carbonaceous sandstone, siltstone and shale. The elevation range is from 1200 to 2500 m; the topography ranges from moderate slopes (10-15%) to steep slopes (71-100%).

The texture ranges from very gravelly sandy loam which commonly occurs on unforested scree slopes of over 400 m in length, to gravelly clay loam, which commonly occurs on moderate slopes near the valley floor. A substantial volume of flat, angular gravel and cobble size fragments, derived from the erodible sedimentary bedrock, occurs throughout most soil profiles. The surface soil horizons to approximately 50 cm depth are very strongly acid; the reaction of subsoil horizons varies with the host bedrock. At several locations the subsoils were found to be calcareous to within 50 to 100 cm of the surface. The influence of coal fragments dispersed throughout some soil profiles is recognized by the black soil matrix and high carbon values. Reclamation programs should recognize the range of pH values and moisture holding capacities in this association.

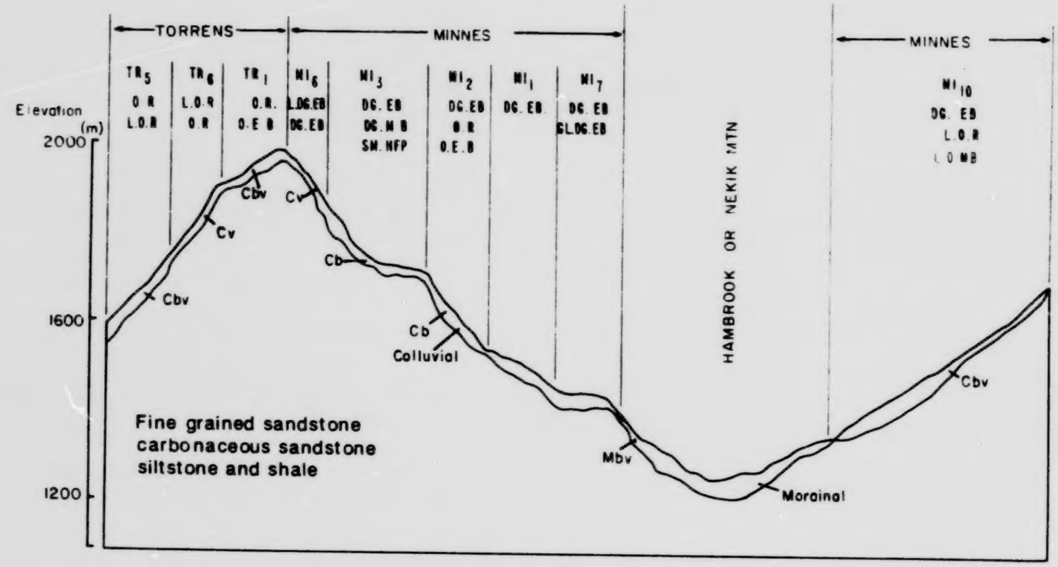
Minnes soils have a loose porous matrix, are rapidly to moderately pervious and the drainage ranges from rapidly to moderately well drained. These loose, shaley soils are subject to failure and creep, especially on nonvegetated slopes greater than 40%. Slopes less than 40% near the valley floors are relatively stable; they also maintain a higher moisture holding capacity.

SOIL PROFILE

Mi$_1$; Degraded Eutric Brunisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - dark grayish brown, gravelly loam
- Bm - very dark grayish brown; gravelly loam
- Bm$_2$ - very dark grayish brown; gravelly loam
- Ck - black ; gravelly clay loam
- R - sandstone, shale

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
Mi1	Degraded Eutric Brunisol		Moderately well	>50
Mi2	Degraded Eutric Brunisol		Well	>50
		Orthic Regosol	Rapidly	>50
		Orthic Eutric Brunisol	Rapidly	>50
Mi3	Degraded Eutric Brunisol		Moderately well	>50
		Degraded Melanic Brunisol	Moderately well	>50
		Sombric Humo-Ferric Podzol	Moderately well	>50
Mi5	Degraded Eutric Brunisol		Well	>50
		Lithic Degraded Eutric Brunisol	Well	<50
Mi6	Lithic Degraded Eutric Brunisol		Well	<50
		Degraded Eutric Brunisol	Well	>50
Mi7	Degraded Eutric Brunisol		Moderately well	>50
		Gleyed Degraded Eutric Brunisol	Imperfectly	>50
Mi10	Degraded Eutric Brunisol		Well	>50
		Lithic Orthic Regosol	Rapidly	<50
		Lithic Orthic Melanic Brunisol	Rapidly	<50
Mi11	Degraded Eutric Brunisol		Moderately well	>50
		Lithic Turbic Regosol	Well	<50
		Lithic Turbic Brunisol	Well	<50



MINNES AND TORRENS SOIL ASSOCIATIONS

TORRENS
MINNES
MINNES
TR5
O.R
L.O.R
TR6
L.O.R
O.R
TR1
O.R.
O.E.B
MI6
L.DG.EB
DG.EB
MI3
DG.EB
DG.M.B
SM.NFP
MI2
DG.EB
O.R
O.E.B
MI1
DG.EB
MI7
DG.EB
GLDG.EB
MI10
DG.EB
L.O.R
L.O.MB
Elevation (m)
2000
1600
1200
Cbv
Cv
Cbv
Cv
Cb
Cb
Colluvial
Mbv
Morainal
Cbv
HAMBROOK OR NEKIK MTN
Fine grained sandstone
carbonaceous sandstone
siltstone and shale

The modal soil development is Degraded Eutric Brunisol (component MI1). Climatically drier south and west facing slopes, often nonforested and subject to creep and failure, include weakly developed soils. These Orthic Regosols and Orthic Eutric Brunisols are included in the MI2 component. Component MI3 indicates inclusions climatically moister soils located in the krummholz. These soils have an organic matter enriched surface horizons (Ah). Component MI5 contains inclusions of soils with lithic contacts within 50 cm of the surface. Component MI6 consists of soils which are dominantly shallow to bedrock. The MI7 component includes soils subject to seepage and gleying. Component MI10 consists of a complex mixture of soils on slopes >15%. These soils are often shallow to bedrock and subject to gullying and snow avalanching. Localized areas of lush herb growth are common. Component MI11 is mapped dominantly in the alpine tundra zone. Inclusions of Lithic Turbic Regosols and Lithic Turbic Brunisols due to periglacial processes are common.

Minnes soils occur dominantly in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region. Some Minnes soils occur in the alpine tundra zone as well, notably components 10 and 11.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse subalpine climate, steep topography and erodible, gravelly soils preclude agricultural uses.
Forestry.	Low capability. The short growing season, high snow packs in many areas and soil moisture deficits in other areas limit the capability.
Ungulates.	Moderate to high capability for caribou and sheep. Browse production for moose appear limited on steep slopes due to a dominance of somewhat droughty stony soils; a low to moderate capability may exist on the moderate lower slope positions.
Recreation.	Moderate to very low carrying capacity. Steep slopes and loose erodible soils are the main limitations.
Engineering.	Severe limitations. Steep slopes, loose, erodible soils, and shallow to bedrock areas all limit engineering activities.

MORKILL SOIL ASSOCIATION (ML)

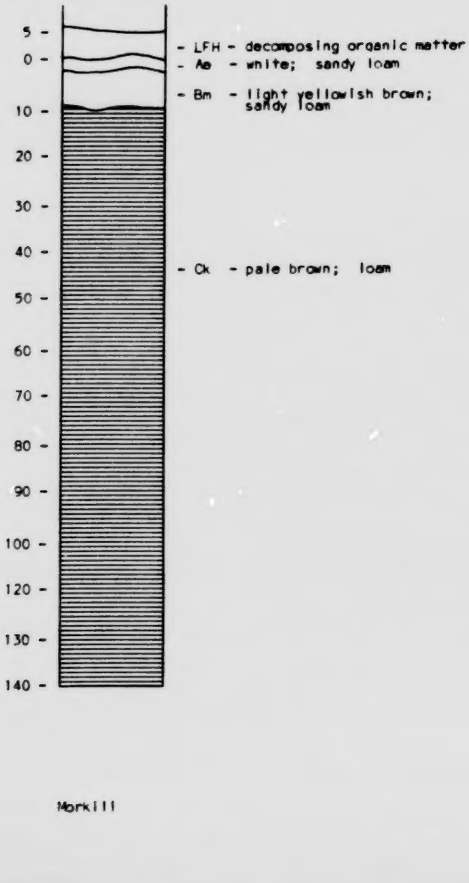
Morkill soils are located mainly along the Morkill River in the Rocky Mountains between elevations of 1200 and 1400 m. The parent materials consist of deeply gullied lacustrine sediments which are comparatively coarser in texture when related to the other lacustrine deposits. The sandy loam to silt loam textures may in part be the result of fluvial or eolian depositional influences.

The topography is extensively gullied. Slopes range from 20 to 80% and only very minor areas of gently sloping terraces occur. Soils analyzed from one gullied terrace section were strongly calcareous to within 8 cm of the soil surface. The soils are well drained, porous, and have a relatively low moisture holding capacity, particularly in the coarser sediments.

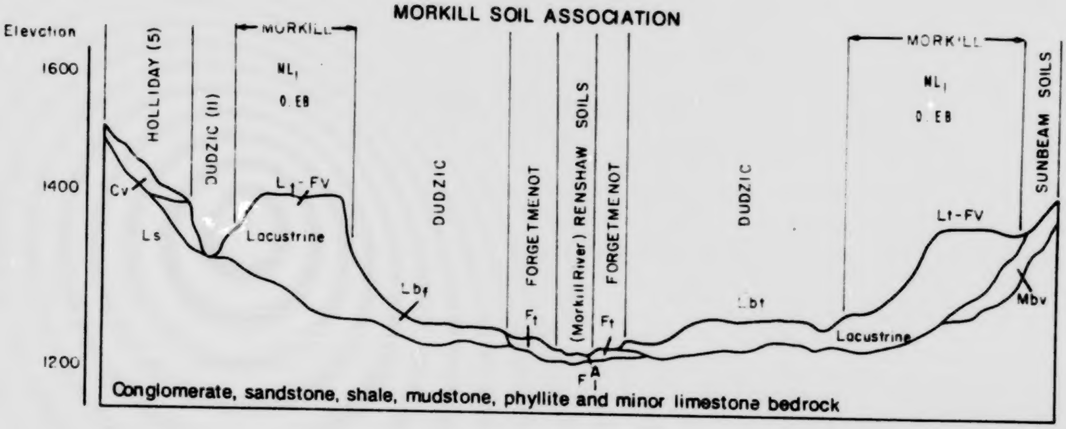
The Morkill association consists of only one component which is Orthic Eutric Brunisol (component ML1) occupies the upper tread and escarpment sections of the gullied terrace remnants. The Dudzic association identifies the lower terrace sections and the gently sloping, eroded, fan-like portions of the remnant terraces. These lower portions are usually podzolized, finer textured, and gleyed.

SOIL PROFILE

ML_1: Orthic Eutric Brunisol



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
ML1	Orthic Eutric Brunisol		Well	>100


MORKILL SOIL ASSOCIATION
Elevation
1600
1400
1200
HOLLIDAY (5)
DUDZIC (II)
MORKILL
ML1
0 EB
Lt-FV
Cv
Ls
Locustrine
DUDZIC
Lbf
FORGETMENOT
Ft
(Morkill River) RENSHAW SOILS
FORGETMENOT
Ft
F A
DUDZIC
Lbf
MORKILL
ML1
0 EB
Lt-FV
Locustrine
Mbv
SUNBEAM SOILS
Conglomerate, sandstone, shale, mudstone, phyllite and minor limestone bedrock

Morkill soils are very susceptible to failure and gullying due to their texture, loose matrix and steep slopes. These soils are geologically hazardous.

Morkill soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse subalpine climate and steep erodible slopes preclude agricultural uses.
Forestry.	Moderate to low capability. Low moisture holding capacity, surface instability, and the cool to cold subalpine climate all limit forest growth.
Ungulates.	Low capability for moose and caribou. Deep snow, the current mature stage of the forest and steep slopes are main limitations for ungulate use. The loose erodable nature of the soils may pose problems for some wildlife management techniques. Browse production would vary, depending upon soil moisture conditions.
Recreation.	Severe limitations. Steep erodible soils limit recreational use.
Engineering.	Severe limitations. Steep slopes, potentially unstable subgrade materials and frost action are limiting to engineering uses.

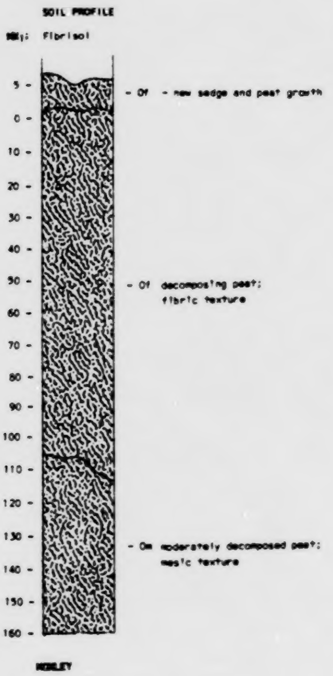
MOXLEY SOIL ASSOCIATION (MX)

Moxley soils are located in the Rocky Mountains, mainly on the east side of the Continental Divide, usually below 1000 m elevation. On the west side of the Divide, very small areas of occur in the lower Herrick and Framstead valleys. Topography is either depressional or level to very gently sloping (<5%).

The organic parent material, consists mainly of sphagnum peat accumulated in bogs. The organic material is essentially undecomposed (fibric). The soils are very poorly drained, with the water table usually within 50 cm of the surface. The underlying mineral substrate is usually similar to that which is mapped adjacent to the bog and most commonly are fluvial or lacustrine sediments.

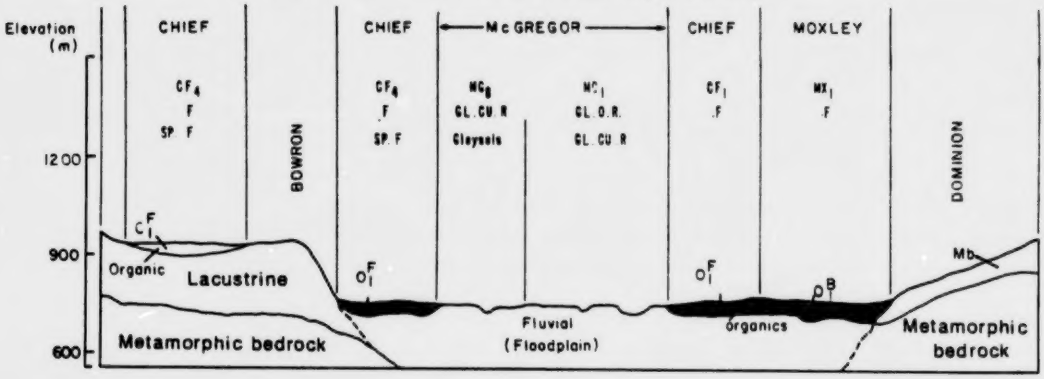
Soil development is of the Fibrisol Great Group and includes at the subgroup level, Sphagno-Fibrisols, Mesic Fibrisols and Terric Fibrisols. The Chief (organic) soil and the McGregor (floodplain) soils are commonly associated with the Moxley association.

Moxley soils are found within the Subboreal white spruce - alpine fir zone: common paper birch subzone of the Subboreal Region.


SOIL PROFILE
MX1: Fibrisol
5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
110 -
120 -
130 -
140 -
150 -
160 -
- Of - new sedge and peat growth
- Of decomposing peat; fibric texture
- Om moderately decomposed peat; mesic texture
MOXLEY

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
MX1	Fibrisol		Very Poorly	>100

MOXLEY, CHIEF AND McGREGOR SOIL ASSOCIATIONS


Elevation (m)
1200
900
600
CHIEF
CF4
F
SP. F
BOWRON
CHIEF
CF4
.F
SP. F
McGREGOR
MC8
GL.CU.R
Gleysols
MC1
GL.O.R.
GL.CU.R
CHIEF
CF1
.F
MOXLEY
MX1
.F
DOMINION
C1 F
Organic
Lacustrine
O1 F
Metamorphic bedrock
Fluvial
(Floodplain)
O1 F
Organics
O1 B
Mb
Metamorphic bedrock

COMMENTS ON LAND USE

Agriculture.	Low capability. Excessive moisture, flooding, and adverse climate are the major limitations.
Forestry.	Very low capability. Very poor drainage restricts tree growth.
Ungulates.	Low to moderate capability for moose. Forage quantity is a main limitation.
Recreation.	Very low carrying capacity. Very poor drainage and a low bearing capacity severely limit recreational use.
Engineering.	Severe limitations. Very poor drainage, flooding and a low bearing capacity are the major limiting factors.

MYHON SOIL ASSOCIATION (MH)

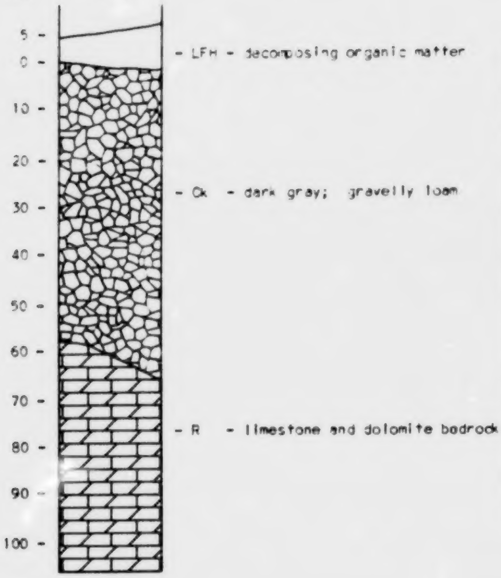
Myhon soils occur in the Rocky Mountains on strong to steep slopes (16 to 100%) between the elevations of 1050 and 1650 m. The parent material is dominantly gravelly sandy loam colluvium subject to snow avalanching. This landscape can be recognized as single avalanche chutes and/or expansive treeless slopes.

The materials are derived from and generally overlie limestone and dolomite with minor amounts of quartzite, sandstone and shale. The coarse fragment content varies. At some locations, downslope of actively eroding bedrock faces, angular gravels, stones and cobbles may contribute to greater than 50% of the soil matrix; at other locations deep gravelly loam deposits form the avalanche run-out zone.

This association is frequently mapped adjacent to or in a complex with Hedrick soils which occur on podzolized, forested colluvial slopes. Myhon soils are also mapped in association with Bastille, Blue Lake, Becker Mountain and Sheba Mountain soil associations.

SOIL PROFILE

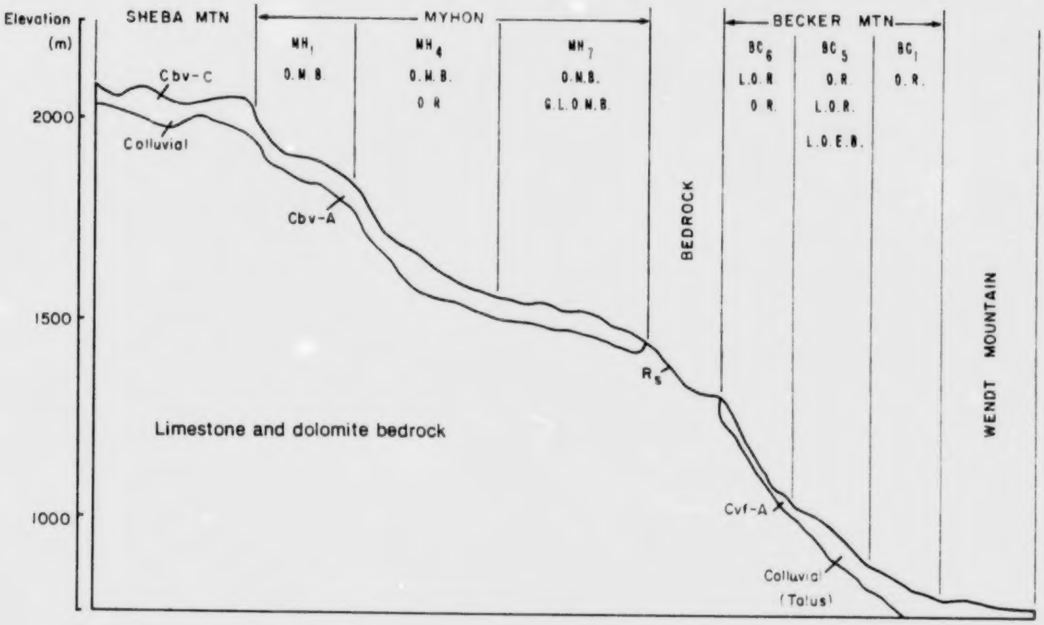
MH4: Orthic Regosol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ck - dark gray; gravelly loam
- R - limestone and dolomite bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
MH1	Orthic Melanic Brunisol		Well to Moderately Well	>50
MH4	Orthic Melanic Brunisol		Well to Moderately Well	>50
		Orthic Regosol	Well to Rapidly	>50
		Lithic Orthic Regosol	Well to Rapidly	<50
MH7	Orthic Melanic Brunisol		Well to Moderately Well	>50
		Gleyed Orthic Melanic Brunisol	Imperfectly	>50

Myhon

MYHON AND BECKER MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
SHEBA MTN
MYHON
BECKER MTN
MH_1
O.M.B.
MH_4
O.M.B.
O.R.
MH_7
O.M.B.
G.L.O.M.B.
BC_6
L.O.R.
O.R.
BC_5
O.R.
L.O.R.
L.O.E.B.
BC_1
O.R.
2000
1500
1000
Cbv-C
Colluvial
Cbv-A
BEDROCK
R_s
Limestone and dolomite bedrock
Cvf-A
Colluvial (Talus)
WENDT MOUNTAIN

The modal soil is an Orthic Melanic Brunisol and commonly supports lush herb and alder growth. The MH4 component includes active avalanche slopes often devoid of tree cover and where the soil lacks horizon development due to surface deposition and/or disturbance. The MH7 component usually includes areas of seepage such as avalanche runout zones and similar zones of snow accumulation.

Myhon soils occur in the Subalpine Engelmann spruce - alpine fir zone, located dominantly in the Subboreal Region and to a lesser extent in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse climate, steep topography and snow avalanching preclude agricultural uses.
Forestry.	Low capability. Erosional processes, in addition to snow avalanching restrict tree growth.
Ungulates.	Low to moderate capability for moose and goat. High grizzly bear capability. Snow depth is a main limitation. Soils on the avalanche runout zone often have a high capability for forage production.
Recreation.	Moderate to very low carrying capacity. Steep slopes, erosion prone surface soils, and saturated areas due to snow melt limit the carrying capacity.
Engineering.	Severe limitations. Steep slopes, snow avalanching, frost action and inclusions of saturated soils are limiting factors for engineering.

NEKIK MOUNTAIN SOIL ASSOCIATION (NK)

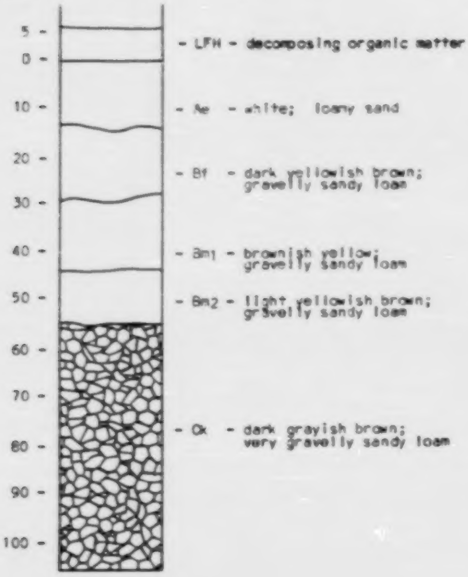
Nekik Mountain soils occur on the broad, flat valley floors of the Rocky Mountain Foothills and on the east flanks of the Rocky Mountains below 1300 m elevation. The soils are developed on relatively shallow, silty till which is derived from, and overlies, fine grained sandstone, carbonaceous sandstone, siltstone and shale. The topography is dominantly very gently to gently sloping (2-9%) with minor inclusions of moderate to strongly sloping (10-20%) bedrock controlled ridges and low profile ancient drainage routes.

Soil textures vary from loam to silt loam and coarse fragment content ranges from 20 to 70%. At the bedrock contact there usually is a zone about 30 to 50 cm thick consisting of weathered rock fragments. The reaction of the upper 50 cm is extremely acid while the subsoils are commonly calcareous. The soils are well to moderately well drained with inclusions of imperfectly drained soils in the low profile drainage routes. The runoff is medium and the perviousness is moderate.

Nekik Mountain soils grade into Bastille soils once the topography increases from moderate to strong slopes, and the bedrock changes to dominantly limestone and dolomite from sandstone and shale.

SOIL PROFILE

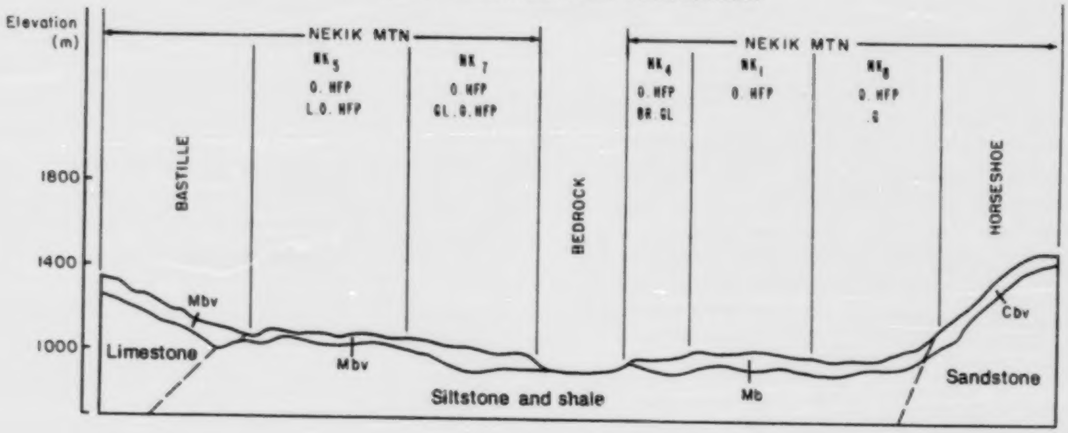
NK_1: Orthic Humo-Ferric Podzol



5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
- LFH - decomposing organic matter
- Ae - white; loamy sand
- Bf - dark yellowish brown; gravelly sandy loam
- Bm1 - brownish yellow; gravelly sandy loam
- Bm2 - light yellowish brown; gravelly sandy loam
- Ck - dark grayish brown; very gravelly sandy loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
NK1	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
NK4	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Brunisolic Gray Luvisol	Moderately Well	>50
NK5	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Lithic Orthic Humo-Ferric Podzol	Moderately Well	<50
NK7	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50
NK8	Orthic Humo-Ferric Podzol		Moderately Well	>50
		Gleysolic	Poorly	>50

NEKIK MOUNTAIN SOIL ASSOCIATION


Elevation (m)
1800
1400
1000
NEKIK MTN
NEKIK MTN
BASTILLE
NK_5
O. HFP
L.O. HFP
NK_7
O. HFP
GL.O.HFP
BEDROCK
NK_4
O. HFP
BR.GL
NK_1
O. HFP
NK_8
O. HFP
.G
HORSESHOE
Mbv
Limestone
Mbv
Siltstone and shale
Mb
Cbv
Sandstone

The modal soil in this association is Orthic Humo-Ferric Podzol (component NK1). The NK4 component includes areas of somewhat finer textures on which Brunisolic Gray Luvisol soils have developed. The NK5 component occurs extensively and includes soils which have a lithic contact at less than 50 cm depth. Soils which are subject to periodic saturation as indicated by mottling and gleying are included in the NK7 component. Component NK8 includes soils which are permanently saturated and often have peaty surface horizons of up to 60 cm in thickness.

Nekik Mountain soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture. Very low capability. The adverse subalpine climate is the major limitation to agriculture. Very limited grazing may be possible.

Forestry. Moderate capability. The subalpine climate with its short growing season is the major limitation.

Ungulates. Low capability for moose. Excessive winter snow depth and the present mature stages of forest cover limits use. The browse capability, during the early seral stages, ranges from low to high depending upon the soil depth and soil mositure regime.

Recreation. Moderate limitations. Silty texture, slope and inclusions of imperfectly to poorly drained soils are the main limitations.

Engineering. Slight to severe limitations. The main limitations involve poor drainage and high water tables at some sites. Areas which are shallow to bedrock may pose only limited constraints since the siltstone and shale is usually rippable.

ONION CREEK SOIL ASSOCIATION (ON)

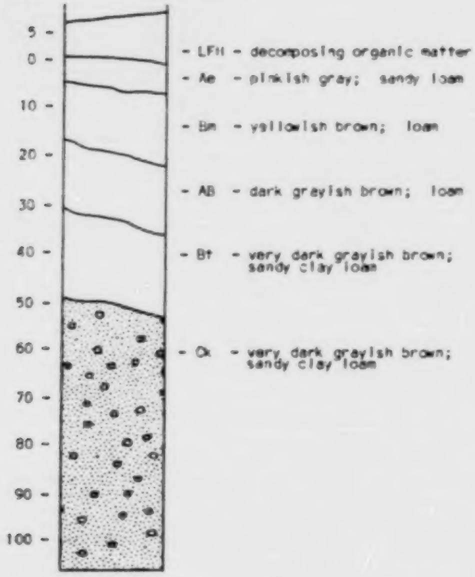
Onion Creek soils occur in the Rocky Mountains and Rocky Mountain Foothills between the elevations of 1050 and 1500 m. The topography is gently to strongly sloping (5-30%). The parent material is gravelly loam to gravelly silt loam calcareous cordilleran till which overlies limestone, dolomite, or siltstone bedrock. The soils are usually calcareous below 50 cm in depth. They are generally moderately well drained, slowly pervious and contain a compact and dense subsoil at >50 cm depth.

Soil development is dominantly Brunisolic Gray Luvisol. In wetter, colder environments, where Onion Creek soils border the Turning Mountain soils, minor inclusions of Orthic Humo-Ferric Podzol and Podzolic Gray Luvisol occur. These soils are mapped as the ON3 component. Component ON5 contains significant shallow to bedrock areas where the soils are Lithic Brunisolic Gray Luvisols.

Onion Creek soils are located in the Subalpine Engelmann spruce - alpine fir zone of the Subborreal Region.

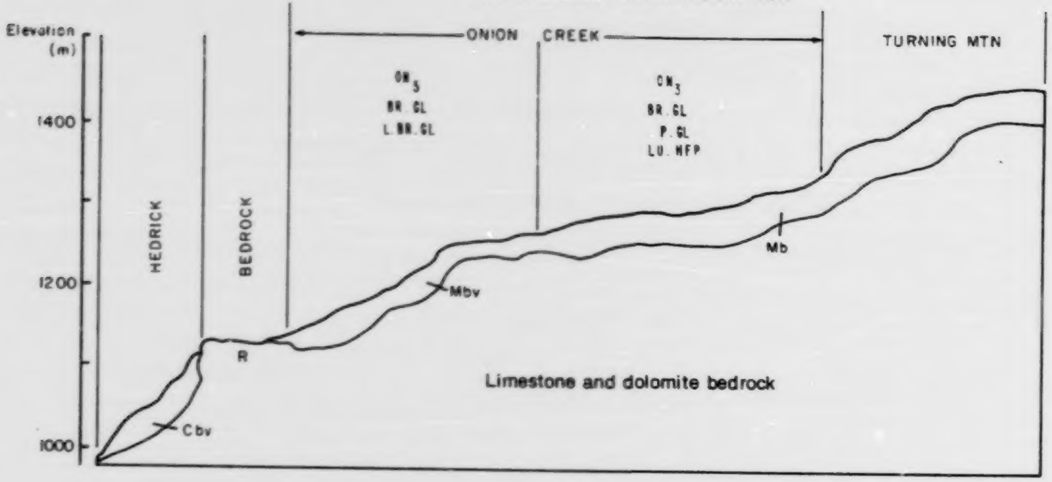
SOIL PROFILE

ON1: Brunisolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - pinkish gray; sandy loam
- Bm - yellowish brown; loam
- AB - dark grayish brown; loam
- Bt - very dark grayish brown; sandy clay loam
- Ck - very dark grayish brown; sandy clay loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
ON3	Brunisolic Gray Luvisol		Well to Moderately Well	>50
		Podzolic Gray Luvisol	Well to Moderately Well	>50
		Luvisolic Humo-Ferric Podzol	Well to Moderately Well	>50
ON5	Brunisolic Gray Luvisol		Well to Moderately Well	>50
		Lithic Brunisolic Gray Luvisol	Well to Moderately Well	<50

ONION CREEK SOIL ASSOCIATION


Elevation (m)
1400
1200
1000
HEDRICK
BEDROCK
ONION CREEK
TURNING MTN
ON$_5$
BR.GL
L.BR.GL
ON$_3$
BR.GL
P.GL
LU.HFP
Cbv
R
Mbv
Mb
Limestone and dolomite bedrock

COMMENTS ON LAND USE

Agriculture. Very low capability. The adverse subalpine climate and stony soils preclude agricultural uses.

Forestry. Low capability. A short growing season and a cold dense compact subsoil restrict root growth and limit the forest capability.

Ungulates. Low capability for moose. Excessive winter snow depth and limited forage quantity due to the current mature successional stage of the forest, are the main limitations to current use. The browse capability during the early seral stages would be dominantly moderate.

Recreation. High to moderate carrying capacity. Moderate slopes and a relatively impervious clayey subsoil, which restricts drainage, are limiting factors for intensive recreational uses.

Engineering. Slight to severe limitations. Steepness of slope and potential frost action impose limits on engineering.

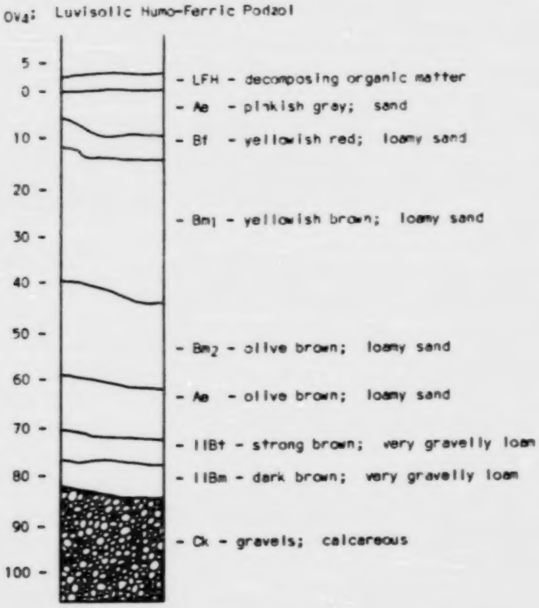
OVINGTON CREEK SOIL ASSOCIATION (OV)

Ovington Creek soils occur in the Rocky Mountains and to a minor extent in the Rocky Mountain Foothills betweem 1000 and 1700 m elevation. They are usually located along the valley floors and are associated with both relic and modern drainage routes. The soils have developed on sandy loam to very gravelly loamy sand fluvioglacial and fluvial deposits. Topography is generally level to very gently sloping (<5%).

The soils are usually characterized by a shallow, extremely acid, yellowish brown to strong brown loamy sand or sand loam surface capping over a coarser, gravelly substrate which is often calcareous below 50 cm in depth. Depending upon the nature of the fluvial deposition and stratigraphy, textural sequences of this association may vary widely with depth.

Soil development is dominantly Orthic Humo-Ferric Podzol (component OV1). Component OV3 is mapped in climatically wetter, higher elevational environments, where significant inclusions of Orthic Ferro-Humic Podzols occur. Component OV4 indicates areas having inclusions of soils with a horizon of clay accumulation within the control section. These are usually due to slightly finer textured parent materials. Components OV5 and OV6 indicate areas where shallow fluvial deposits mantle bedrock terraces. Component OV5 indicates inclusions of shallow soils while component OV6 indicates their dominance. Component OV7 identifies inclusions of soils subject to seepage and a periodic high water table. Component OV8 indicates that some soils with permanently saturated soil conditions occur; these wet soils may have up to 60 cm of peat accumulation at the surface.

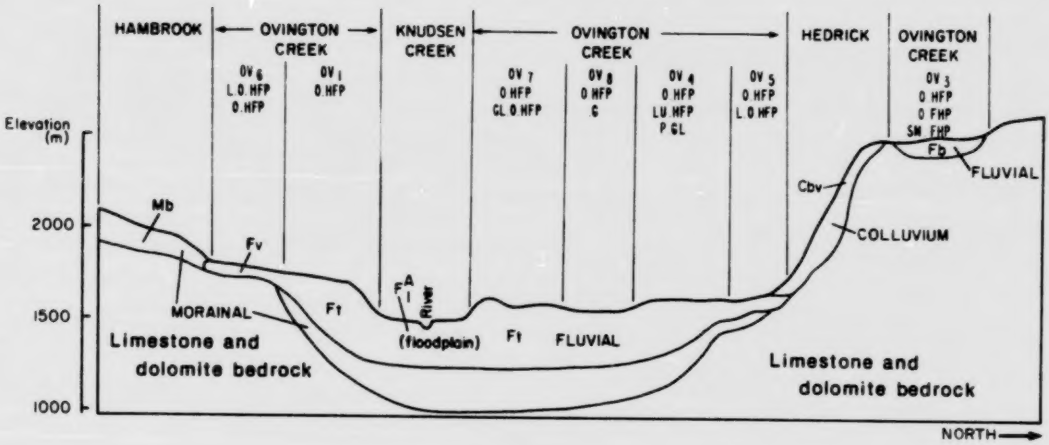
SOIL PROFILE


OV4: Luvisolic Humo-Ferric Podzol
5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - pinkish gray; sand
- Bf - yellowish red; loamy sand
- Bm1 - yellowish brown; loamy sand
- Bm2 - olive brown; loamy sand
- Ae - olive brown; loamy sand
- IIBt - strong brown; very gravelly loam
- IIBm - dark brown; very gravelly loam
- Ck - gravels; calcareous

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
OV1	Orthic Humo-Ferric Podzol		Well to Rapidly	>100
OV3	Orthic Humo-Ferric Podzol		Well to Moderately Well	>100
		Orthic Ferro-Humic Podzol	Well to Moderately Well	>100
		Sombric Ferro-Humic Podzol	Well to Moderately Well	>100
OV4	Orthic Humo-Ferric Podzol		Well to Moderately Well	>100
		Luvisolic Humo-Ferric Podzol	Well to Moderately Well	>100
		Podzolic Gray Luvisol	Well to Moderately Well	>100
OV5	Orthic Humo-Ferric Podzol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
OV6	Lithic Orthic Humo-Ferric Podzol		Well	<50
		Orthic Humo-Ferric Podzol	Well	>50
OV7	Orthic Humo-Ferric Podzol		Well	>100
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>100
OV8	Orthic Humo-Ferric Podzol		Moderately Well	>100
		Gleysolic	Poorly	>100

Ovington

OVINGTON CREEK SOIL ASSOCIATION


HAMBROOK
OVINGTON CREEK
OV 6
L.O.HFP
O.HFP
OV 1
O.HFP
KNUDSEN CREEK
OVINGTON CREEK
OV 7
O.HFP
GL.O.HFP
OV 8
O.HFP
G
OV 4
O.HFP
LU.HFP
P.GL
OV 5
O.HFP
L.O.HFP
HEDRICK
OVINGTON CREEK
OV 3
O.HFP
O.FHP
SM.FHP
Elevation (m)
2000
1500
1000
Mb
Fv
MORAINAL
Ft
FA I
River
(floodplain)
Ft
FLUVIAL
Limestone and dolomite bedrock
Limestone and dolomite bedrock
Cbv
COLLUVIUM
Fb
FLUVIAL
NORTH

Ovington Creek soils are commonly mapped along the Narraway River adjacent to Knudsen Creek and Hambrook soil associations.

Ovington Creek soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region and to a limited extent, in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate is the major limitation.
Forestry.	Low capability. Short growing season is restrictive to tree growth.
Ungulates.	Low capability for moose. Excessive snow depth and limited forage quantity due to the current mature stage of forest cover are the main limitations. The browse capability, during the early seral stages, ranges from medium to high with inclusions of low on the coarser droughty sites. Imperfect and poorly drained soil components should have a high capability.
Recreation.	High to very high carrying capacity.
Engineering.	Slight limitations. Frost action is the only limiting factor.

PAKSUMO SOIL ASSOCIATION (PK)

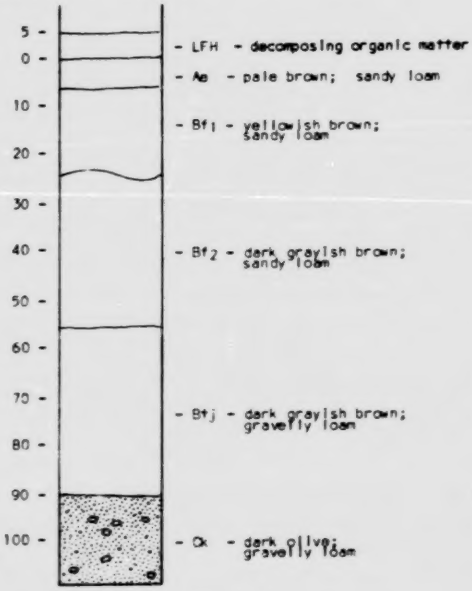
Paksumo soils are located along the Continental Divide in the Rocky Mountains at elevations between 1050 and 1650 m, mainly along the Continental Divide between Cecilia Lake and Wapiti Pass. The soils are developed on morainal materials which are derived from, and generally overlie, quartzite and minor limestone, dolomite and shale bedrock.

The topography varies from moderate (10-15%) to extreme slopes (46-70%). The soil textures range from very gravelly loam to silt loam; coarse fragment contents range from 20 to 60%. Paksumo soils often contain a substantial volume of blocky quartzite, cobbles, stones and boulders, especially on cirque floors and in the vicinity of steep eroding quartzite walls.

The surface horizons of most Paksumo soils on slopes >20% have been somewhat modified by slope movement processes such as soil creep and frost action and have a looser matrix and higher permeability than the more compact subsoil. The soils are generally well to moderately well drained, are moderately pervious and have medium runoff and moderate moisture holding capacity. The reaction of subsoils are variable, a dominant quartzite lithology and bedrock site results in extremely acid conditions; whereas a local site with a substantial limestone presence, will result in calcareous conditions.

SOIL PROFILE

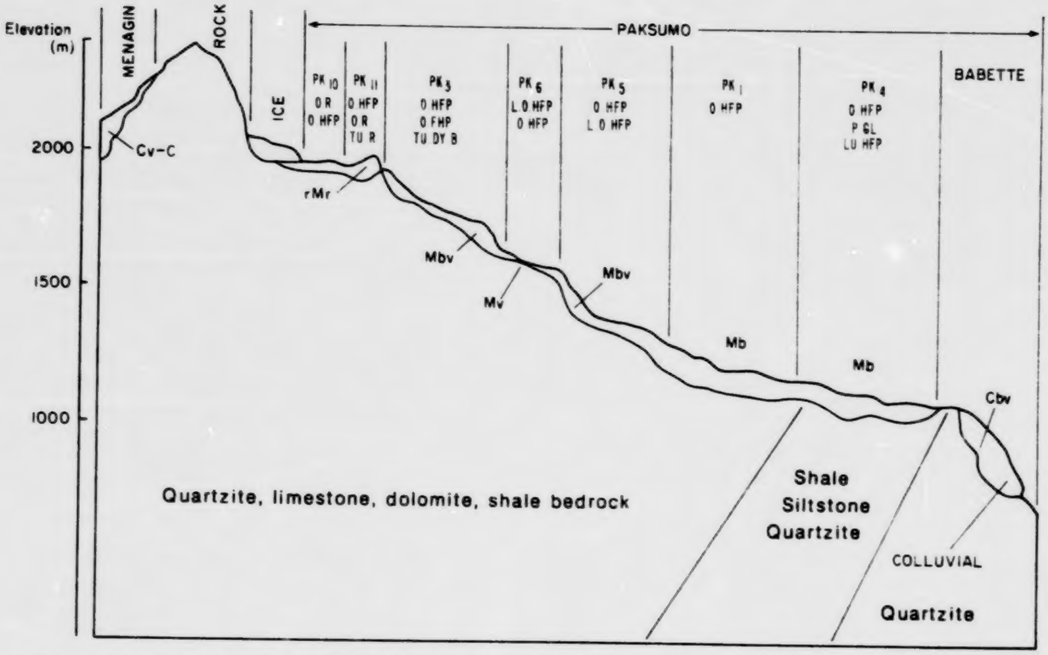
PK1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - pale brown; sandy loam
- Bf1 - yellowish brown; sandy loam
- Bf2 - dark grayish brown; sandy loam
- Btj - dark grayish brown; gravelly loam
- Ck - dark olive; gravelly loam

Paksumo

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
PK1	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
PK3	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Orthic Ferro-Humic Podzol	Well to Moderately Well	>50
		Turbic Dystric Brunisol	Well to Moderately Well	>50
PK4	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Podzolic Gray Luvisol	Well to Moderately Well	>50
		Luvisolic Humo-Ferric Podzol	Well to Moderately Well	>50
PK5	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well to Moderately Well	<50
PK6	Lithic Orthic Humo-Ferric Podzol		Well to Moderately Well	<50
		Orthic Humo-Ferric Podzol	Well to Moderately Well	>50
PK10	Orthic Regosol		Well to Rapidly	>50
		Orthic Humo-Ferric Podzol	Well to Rapidly	>50
PK11	Orthic Humo-Ferric Podzol		Well to Rapidly	>50
		Orthic Regosol	Well to Rapidly	>50
		Turbic Regosol	Well to Rapidly	>50

PAKSUMO SOIL ASSOCIATION


Elevation (m)
2000
1500
1000
MENAGIN
ROCK
ICE
PAKSUMO
BABETTE
PK10 O R O HFP
PK11 O HFP O R TU R
PK3 O HFP O FHP TU DY B
PK6 L O HFP O HFP
PK5 O HFP L O HFP
PK1 O HFP
PK4 O HFP P GL LU HFP
Cv-C
rMr
Mbv
Mv
Mbv
Mb
Mb
Cbv
Quartzite, limestone, dolomite, shale bedrock
Shale
Siltstone
Quartzite
COLLUVIAL
Quartzite

The modal soil is Orthic Humo-Ferric Podzol (component PK1). Soils which subject to more intense weathering such as those located in the upper subalpine meadows near the krummholz and zone are included in PK3 component. Component PK4 indicates areas where inclusions of finer textures occur over belts of siltstone and shale and some of the soils have clay enriched subsoil horizons. Component PK5 indicates inclusions of lithic soils and component PK6 indicates a dominance of lithic soils. The PK10 component is mapped where soils consisting of very rubbly quartzite blocks occur at and above the tree line. Due to the coarse textures and continuous frost action these soils usually lack soil development. Component PK11 identifies recent morainal ridges and terminal moraines where the soils also often lack soil development.

Paksumo soils are usually mapped in complexes with Babette soils which are derived from quartzite-dominated colluvium.

Paksumo soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The subalpine climate, steep slopes and excessive stoniness preclude agricultural uses.
Forestry.	Low capability. The short growing season and excessively coarse textures are the major limitations to forest growth.
Ungulates.	Low capability for moose; low to moderate capability for caribou. Capability for browse varies from low to moderate depending upon the soil moisture regime.
Recreation.	Slight to severe limitations. The carrying capacity is limited primarily by the steepness of slopes. Surface stoniness also hampers some recreational uses.
Engineering.	Slight to severe. Potential frost action, steepness of slope, and shallowness to bedrock all impose a range of limitations on engineering applications.

PALSSON SOIL ASSOCIATION (PL)

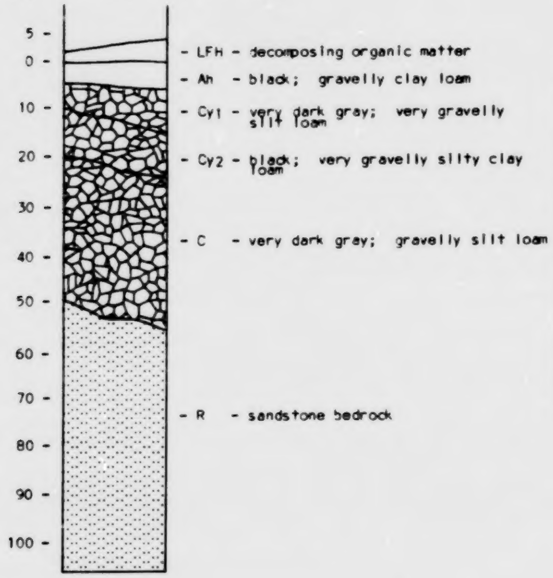
Palsson soils are located in the Rocky Mountain Foothills on very gentle (2 to 5%) to extreme (46 to 70%) slopes which occur in alpine environments above 1650 m elevation. These rubbly sandy to silty colluvial soils are derived from, and overlie fine-grained sandstone, carbonaceous sandstone, siltstone and shale bedrock. This bedrock is geologically classed in the Jurassic and Cretaceous Minnes Group. The soils range in texture from gravelly sandy loam to gravelly silt loam and contain from 20 to 80% angular coarse fragments by volume.

The soils are subject to periglacial (cold-climate) processes such as cryoturbation, solifluction, and nivation. The soil landscape consists of a wide variety of micro and meso sites very common to alpine environments. Most soils are moderately well drained, moderately pervious, and depending upon the turbic activity are usually medium acid throughout the control section. Soil horizons often exhibit a black matrix due to the presence of coal particles and high carbon content.

The modal soil development for the association is a Turbic Orthic Regosol (component PL1). Located in slightly wetter and somewhat more stable areas, the PL3 component includes soils with Brunisolic soil development. The PL6 component identifies inclusions of alpine ridge areas that are shallow to bedrock, windswept and consist of a stone pavement surface.

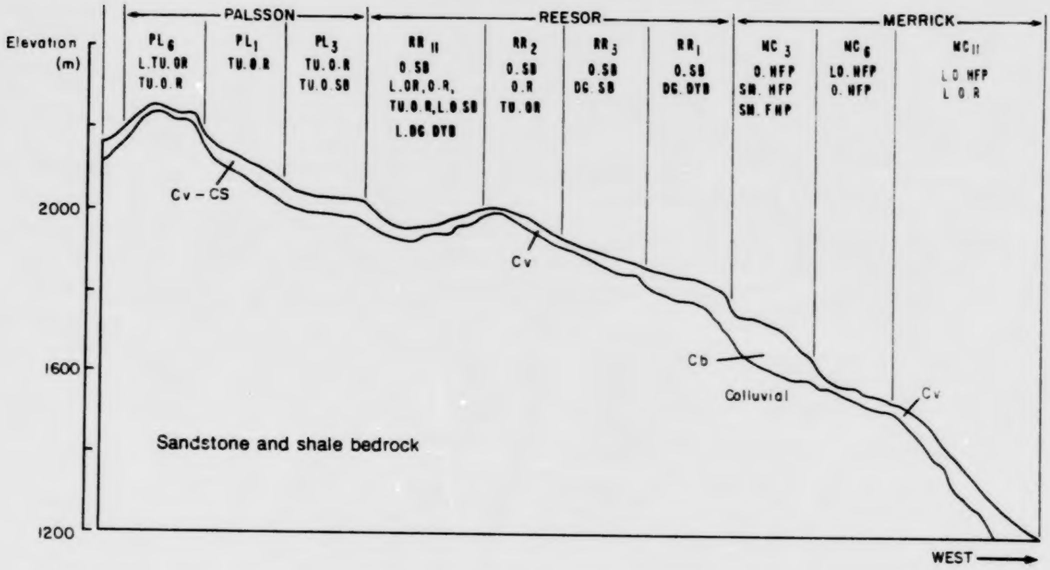
SOIL PROFILE

PL6: Lithic Turbic Orthic Regosol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ah - black; gravelly clay loam
- Cy1 - very dark gray; very gravelly silt loam
- Cy2 - black; very gravelly silty clay loam
- C - very dark gray; gravelly silt loam
- R - sandstone bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
PL1	Turbic Orthic Regosol		Moderately Well	>50
PL3	Turbic Orthic Regosol		Moderately Well	>50
		Turbic Orthic Sombric Brunisol	Moderately Well	>50
PL6	Lithic Turbic Orthic Regosol		Moderately Well	<50
		Turbic Orthic Regosol	Moderately Well	>50

PALSSON, REESOR AND MERRICK SOIL ASSOCIATIONS


PALSSON
REESOR
MERRICK
Elevation (m)
2000
1600
1200
PL_6 L.TU.OR TU.O.R
PL_1 TU.O.R
PL_3 TU.O.R TU.O.SB
RR_{11} O.SB L.OR,O.R, TU.O.R,L.O.SB L.DG.DYB
RR_2 O.SB O.R TU.OR
RR_3 O.SB DG.SB
RR_1 O.SB DG.DYB
MC_3 O.HFP SM.HFP SM.FHP
MC_6 LO.HFP O.HFP
MC_{11} LO.HFP L.O.R
Cv – CS
Cv
Cb
Colluvial
Cv
Sandstone and shale bedrock
WEST

Palsson soils are mapped in the Ptarmigan Mountain area as well as in high elevations north of Belcourt Creek. Reesor soils occur downslope of the Palsson association in the krummholz subzone.

Palsson soils occur in the Alpine Tundra zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture. Extremely low capability. The adverse alpine climate, steep ranges. stony conditions and intense frost heaving of soils preclude agricultural uses.

Forestry. Extremely low capability. The alpine climate prevents tree growth.

Ungulates. Low to moderate capability for caribou and goat. Forage quantity which is variable, due to the nature of soil erosional processes and areas of excessive winter snow depth are the main limitations.

Recreation. Low to very low carrying capacity. Periglacial (cold climate) processes which disrupt and alter soil conditions cause them to be unsuitable for intense use. Many inclusions of steep slopes also imposes limits on recreational uses.

Engineering. Moderate to severe limitations. Steep slopes and intense frost action, creating soil conditions which are very problematic for subgrade and foundation construction.

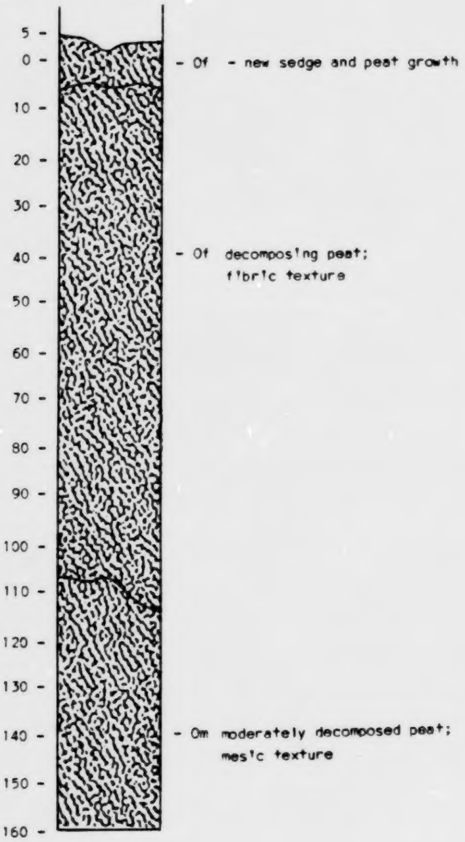
PAPOOSE SOIL ASSOCIATION (PO)

Papoose soils occur mainly on the floor of the Rocky Mountain Trench in the vicinity of the Fraser River floodplain. These organic deposits, classified as fens, are identified mainly by the presence of open water surrounded by a floating mat of fibric peat composed largely of carex species. The water level is usually at the surface throughout the year and is thought to be minerotrophic due to the relatively active inflow of groundwater.

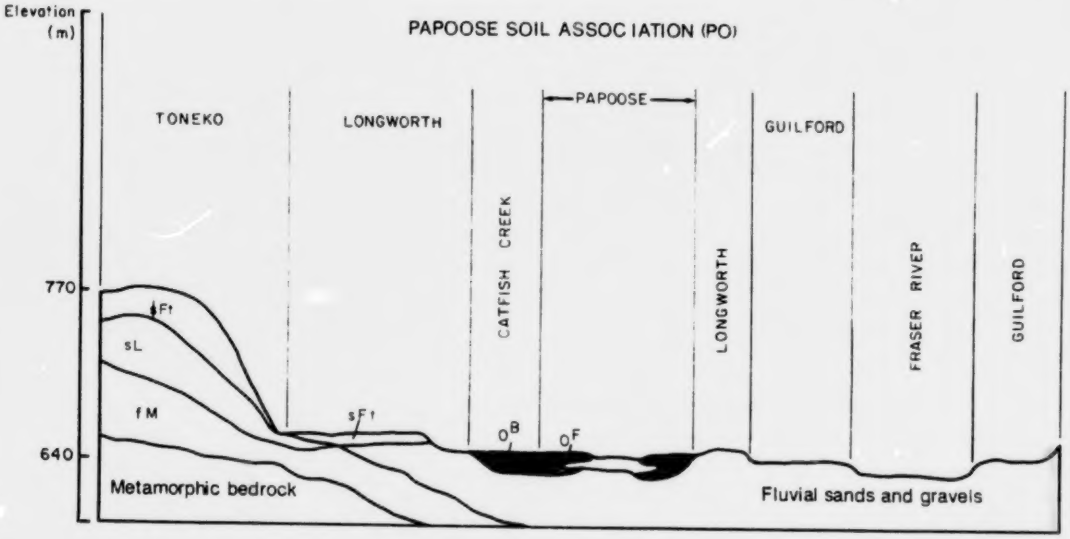
These organic soils are mostly classified as Typic Mesic Fibrisols and Typic Fibrisols. The peat deposits are normally greater than 160 cm in depth, and are relatively undecomposed. In some locations a hydric horizon is present, resulting in Hydric Fibrisols; these areas could not be specifically delineated during the course of the survey.

SOIL PROFILE

PO1; Typic Fibrisol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
- Of - new sedge and peat growth
- Of decomposing peat; fibric texture
- Om moderately decomposed peat; mesic texture

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
PO1	Typic Fibrisol	Typic Mesic Fibrisol	Very Poorly	>160


Elevation (m)
PAPOOSE SOIL ASSOCIATION (PO)
TONEKO
LONGWORTH
PAPOOSE
GUILFORD
CATFISH CREEK
LONGWORTH
FRASER RIVER
GUILFORD
770
640
sFt
sL
fM
sFt
OB
OF
Metamorphic bedrock
Fluvial sands and gravels

Papoose soils frequently grade into Catfish Creek soils (bogs) on the perimeter of large organic deposits.

These soils are located in both the Interior western hemlock - western red cedar zone and Interior western red cedar - white spruce zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. High water table and flooding preclude agricultural uses.
Forestry.	Extremely low capability. Flooding and very poor drainage restrict tree growth.
Ungulates.	Low to moderate capability for moose and caribou.
Recreation.	Severe limitations to recreational use. High water table and flooding restrict use.
Engineering.	Severe limitations. High water table, flooding and very low bearing capacity limit engineering use.

PAXTON MOUNTAIN SOIL ASSOCIATION (PX)

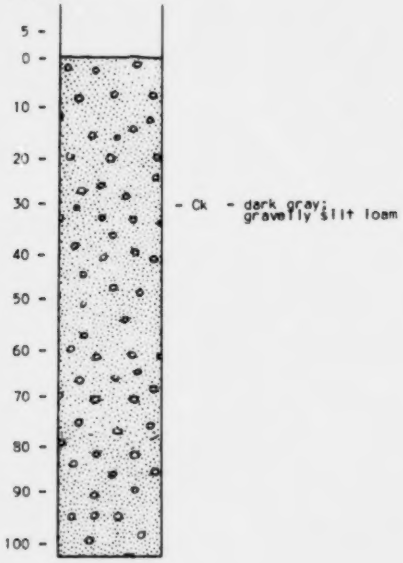
Paxton Mountain soils occur in and above the krummholz subzone of the Rocky Mountains at elevations above 1600 m. These soils have developed on a relatively recent calcareous, gravelly sandy loam to loam till. The topography includes gentle to strong slopes, which usually range from 5 to 30%. Periglacial processes were not always evident but are known to occur at these elevations.

The till is derived from and generally overlies limestone and dolomite with minor inclusions of quartzite and shale. Very recent moraine, in the vicinity of glacial ice, usually consists dominantly of angular cobble to boulder size clasts in a matrix of highly calcareous sand and gravel.

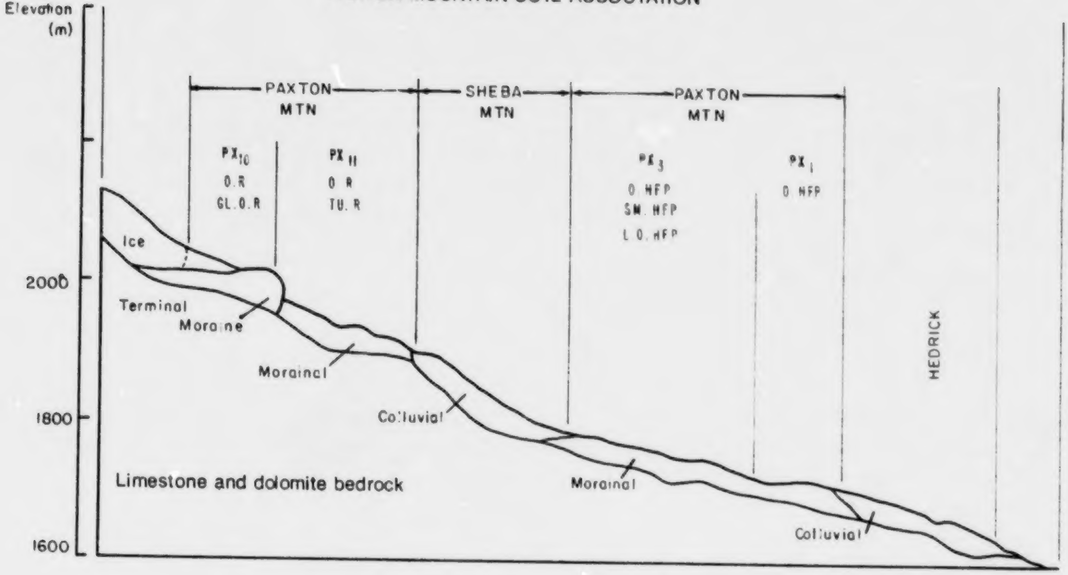
The soils are well to moderately well drained, moderately pervious and are often subject to snowpack accumulation lasting throughout the summer. They are generally calcareous within 50 cm of the surface and often the calcareousness extends to the surface.

SOIL PROFILE

PX11; Orthic Regosol



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
PX1	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
PX3	Orthic Humo-Ferric Podzol		Well to Moderately Well	>50
		Sombric Humo-Ferric Podzol	Well to Moderately Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well to Moderately Well	<50
PX10	Orthic Regosol		Rapidly	>50
		Gleyed Orthic Regosol	Imperfectly	>50
PX11	Orthic Regosol		Rapidly	>50
		Turbic Regosol	Moderately Well	>50



PAXTON MOUNTAIN SOIL ASSOCIATION

Elevation (m)
2000
1800
1600
PAXTON MTN
SHEBA MTN
PAXTON MTN
PX10
O.R
GL.O.R
PX11
O.R
TU.R
PX3
O.HFP
SM.HFP
LO.HFP
PX1
O.HFP
Ice
Terminal Moraine
Morainal
Colluvial
Limestone and dolomite bedrock
Morainal
Colluvial
HEDRICK

The modal soil development is Orthic Humo-Ferric Podzol (component PX1). The PX3 component generally occurs in open meadow common on cirque floors as well as on nonforested areas throughout the krummholz subzone. Component PX10 consists of areas of recent ice retreat where a mixture of fluvioglacial and morainal materials occur. Component PX11 occupies recent calcareous morainal ridges and blankets subject to encroaching pioneer vegetation.

Paxton Mountain soils occur in the Subalpine Engelmann spruce - alpine fir zone, dominantly in the Subboreal Region and subdominantly in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. The adverse subalpine climate, excessive snow pack and stoniness preclude agricultural uses.
Forestry.	Very low capability. These soils occur in the krummholz subzone, where the climate is so severe only stunted tree islands exist.
Ungulates.	Low to moderate capability for moose, caribou, and goats. Excessive winter snow depth and limited forage quantity due to the cold conditions limit ungulate use. Forage capability is variable, productive sites usually occur as dense patches along water courses.
Recreation.	Moderate carrying capacity. The soils are sensitive to intensive uses.
Engineering.	Slight to severe limitations. Steepness of slope and frost action are the major limiting factors.

PTARMIGAN SOIL ASSOCIATION (PM)

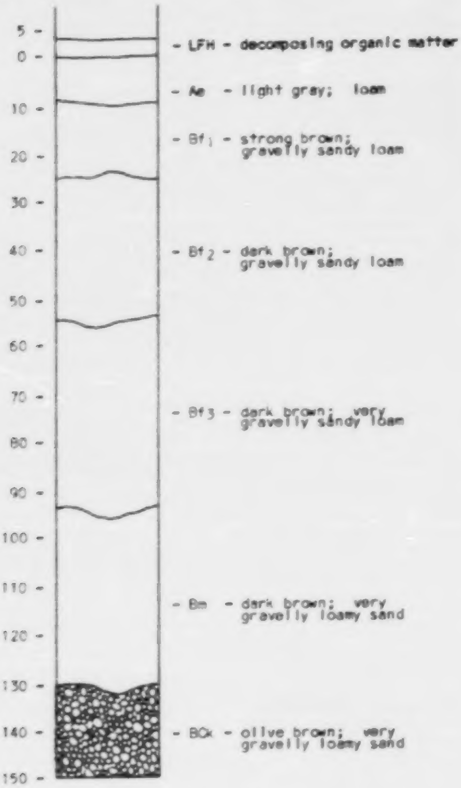
Ptarmigan soils occur in the Rocky Mountain Trench and on the McGregor Plateau at elevations from 730 to 1200 m. These soils have developed in deep, gravelly fluvial deposits which are usually located at the intersection of the major valley floors and the secondary drainages flowing from the side valleys. The deposits are usually in the form of terraces but also include blankets, hummocks and level surface expressions. Most of the deposits lie adjacent to active streams and as such are often subject to lateral erosion and stream undercutting.

The stratigraphy generally includes a surface capping of stone free loamy sand or sandy loam; occasional bedded silts and sands may occur throughout the underlying gravelly matrix. Topography is dominantly nearly level to very gently sloping (0-6%), with minor inclusions of gentle to moderate slopes (6-15%).

The soils are well to moderately well drained, have low moisture holding capacity, and are rapidly to moderately pervious. They are very strongly acid in the surface horizons and grade to mildly alkaline at around 1 m, which is often at a zone of carbonate accumulation.

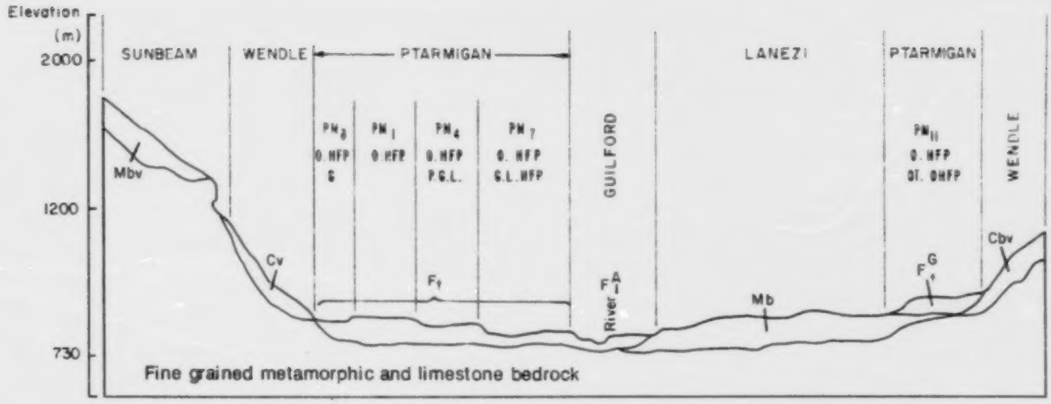
SOIL PROFILE

PM1; Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
- LFH - decomposing organic matter
- Ae - light gray; loam
- Bf1 - strong brown; gravelly sandy loam
- Bf2 - dark brown; gravelly sandy loam
- Bf3 - dark brown; very gravelly sandy loam
- Bm - dark brown; very gravelly loamy sand
- BCk - olive brown; very gravelly loamy sand

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
PM1	Orthic Humo-Ferric Podzol		Well	>100
PM4	Orthic Humo-Ferric Podzol			
		Podzolic Gray Luvisol	Moderately Well	>100
		Luvisolic Humo-Ferric Podzol	Moderately Well	>100
PM7	Orthic Humo-Ferric Podzol		Well	>100
		Gleyed Humo-Ferric Podzol	Imperfectly	>100
PM8	Orthic Humo-Ferric Podzol		Moderately Well	>100
		Gleysolic	Poorly	>100
PM11	Orthic Humo-Ferric Podzol		Well	>100
		Ortstein Humo-Ferric Podzol	Moderately Well	>100

PTARMIGAN SOIL ASSOCIATION


Elevation (m)
2000
1200
730
SUNBEAM
WENDLE
PTARMIGAN
LANEZI
PTARMIGAN
PM8 O.HFP G
PM1 O.HFP
PM4 O.HFP P.G.L.
PM7 O.HFP G.L.HFP
GUILFORD
PM11 O.HFP OT. OHFP
WENDLE
Mbv
Cv
F
FA
River
Mb
FG
Cbv
Fine grained metamorphic and limestone bedrock

Ptarmigan soils are dominantly Orthic Humo-Ferric Podzol (component PM1). Soils containing lenses of finer textures, which enhance zones of clay accumulation, are included in component PM4. Soils subject to seepage and periodic saturated soil conditions are mottled and have gleyed colours and these form part of component PM7. Soils subject to prolonged saturation and reducing conditions are Gleysolic and are mapped as part of PM8. Soils which contain cemented ortstein horizons are included in the PM11 component.

The soils with cemented subsoils in PM11 component are similar to the Seebach Series as described in the report "Soils of the Upper Part of the Fraser Valley", Report No. 10. 1970.

This association is mapped mainly in the interior western hemlock - western red cedar zone and to a minor extent, in the interior western red cedar - white spruce zone. Both zones occur in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Generally low capability with minor areas of moderate capability. Stoniness and moisture deficiencies are the main limitations.
Forestry.	Moderate capability for white spruce. Nutrient deficiencies and low moisture-holding capacities impose some limitations to growth. Climate is the major controlling factor.
Ungulates.	Moderate to high capability for moose. Capability for browse production, during the early seral stages, varies from low to high depending upon the soil moisture regime. Imperfect and poorly drained soils should have a higher productivity.
Recreation.	Slight to moderate limitations. Soil drainage and surface stoniness may limit the use of some sites.
Engineering.	Slight limitations. These soils are potential aggergate sources; they generally sustain few limitations for engineering uses, except for the poorly and imperfectly drained soils, which could impose some instability for subgrade.

RAMSEY SOIL ASSOCIATION (RM)

Ramsey soils are located in the Rocky Mountains on the west side of the Continental Divide below 1100 m elevation. Only very small areas of this association have been mapped, mainly along the margins of Herrick and Jarvis creeks. The soils occur on level to gently sloping (0-9%) topography. The parent material is mostly terraced gravelly sandy loam to very gravelly loamy sand fluvial or glaciofluvial deposits. Associated kames and kettles are included.

These soils are generally well drained with substantial imperfectly drained inclusions. They are very strongly acid throughout the solum and depending upon the source of the materials, some may be calcareous at depths of more than 1 m.

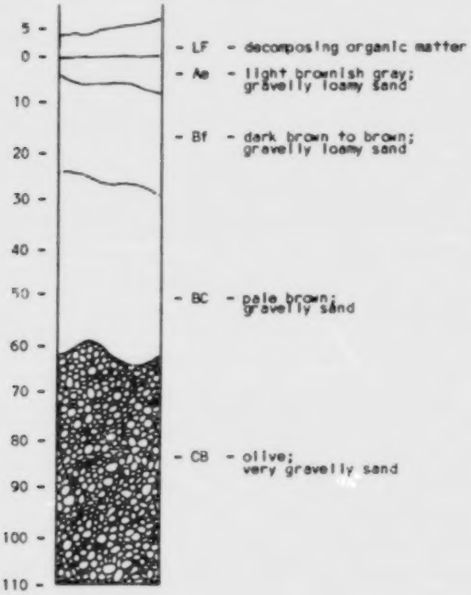
Modal soil development is Orthic Humo-Ferric Podzol. The RM7 component is the only component identified in the report area and consists dominantly of Orthic Humo-Ferric Podzols with substantial inclusions of Gleyed Humo-Ferric Podzols.

The Ramsey soils mapped in the report area are similar to those described by Dawson (in preparation) and by Vold *et al.* (1977).

In this report area, Ramsey soils occur in the Subboreal white spruce - alpine fir zone: common paper birch subzone of the Subboreal Region.

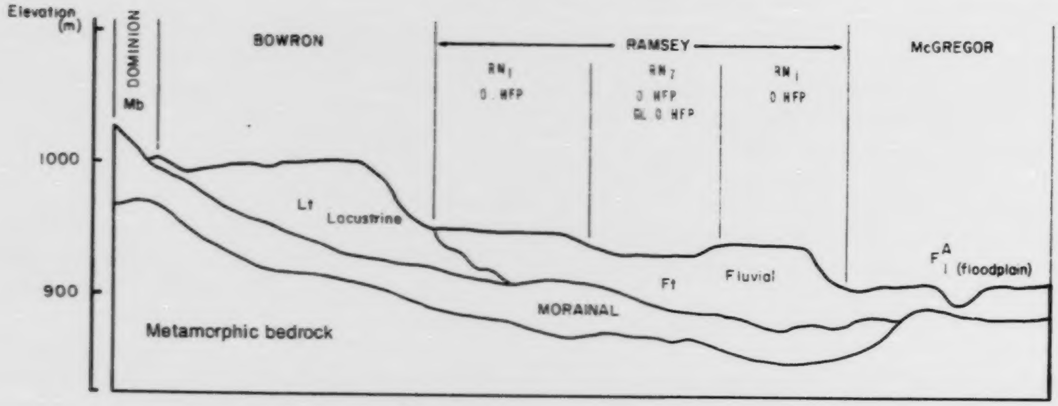
SOIL PROFILE

RM1: Orthic Humo-Ferric Podzol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
110 -
- LF - decomposing organic matter
- Ae - light brownish gray; gravelly loamy sand
- Bf - dark brown to brown; gravelly loamy sand
- BC - pale brown; gravelly sand
- CB - olive; very gravelly sand

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
RM7	Orthic Humo-Ferric Podzol		Well	>100
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>100

RAMSEY SOIL ASSOCIATION


Elevation (m)
1000
900
DOMINION
Mb
BOWRON
RAMSEY
RN_1
O.HFP
RN_2
O.HFP
GL O.HFP
RN_1
O.HFP
McGREGOR
Lt
Locustrine
Ft
Fluvial
F_l^A (floodplain)
MORAINAL
Metamorphic bedrock

COMMENTS ON LAND USE

Agriculture.	Low capability. Droughtiness, stoniness, and adverse climate are main limitations.
Forestry.	Moderate capability. Low water retention in the coarse-textured parent material may result in moisture deficiencies.
Ungulates.	Low to moderate capability for moose. Excessive winter snow depth limits other ungulates. Potential browse capability during the early seral stages, will vary from low to inclusions of high, depending mostly upon the soil moisture regime.
Recreation.	Moderate to high carrying capacity. Ramsey soils generally consist of deep, well drained soils which pose few problems for recreational use. Areas of gleyed soils, however, restrict some recreational uses.
Engineering.	Slight limitations. These soils have no major limitations to use although inclusions of imperfectly drained soils may pose some minor problems for subgrade stability. The soils are also potential aggregrate sources.

RAUSH SOIL ASSOCIATION (RH)

Raush soils occur on the floor of the Rocky Mountain Trench between the elevations of 760 and 1000 m. The soils have developed in deep, stratified, silty clay lacustrine sediments. They are extensive and lie between the upslope morainal deposits and the escarpments leading to the Fraser River. The topography is usually very gently sloping (2-5%) but includes areas of gentle to moderate slopes (6-15%).

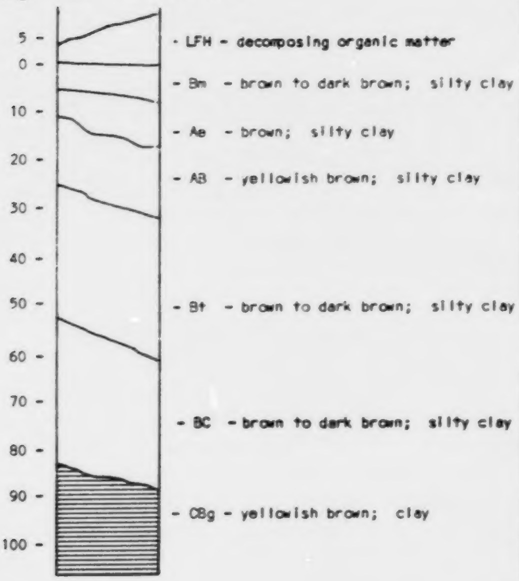
At depths greater than 1 m, subsoil textures range from silty clay to clay. The surface soil textures are only slightly less clayey and fall into the silty clay class. The soils to an approximate depth of 25 cm are very acidic; a zone of clay accumulation exists in the lower solum and at depths greater than 80 cm the horizons are weakly calcareous. Depth to gleying and weathering varies with drainage class although at depths below 80 cm these conditons are usual.

Soil drainage varies from moderately well drained knolls to imperfectly drained sloping positions and poorly drained depressions. The surface horizons are moderately to slowly pervious, while those at depth are slowly pervious. The firm, stratified subsoils remain moist throughout the year.

Raush soil development is dominantly Orthic Gray Luvisol (component RH1). Inclusions of Brunisolic Grey Luvisol and Podzolic Gray Luvisol occur at slightly higher elevations adjacent to the steeper valley walls; these soils are included in component RH3. The RH4 component includes soils with 20 to 50 cm of sandy loam to silt loam fluvial capping over the clayey material. These soils are transitional to the Toneko association (component TO4) and is very prone to erosion following clearing;see Plate 3.2 , page 77. Gleyed Orthic Gray Luvisols are periodically saturated and gleyed and mottled in the subsoil. These form part of RH7. Component RH8 includes soils subject to permanently restricted drainage. These Gleysolic soils often have peaty surface horizons up to 60 cm in depth.

SOIL PROFILE

RH3: Brunisolic Gray Luvisol


5
0
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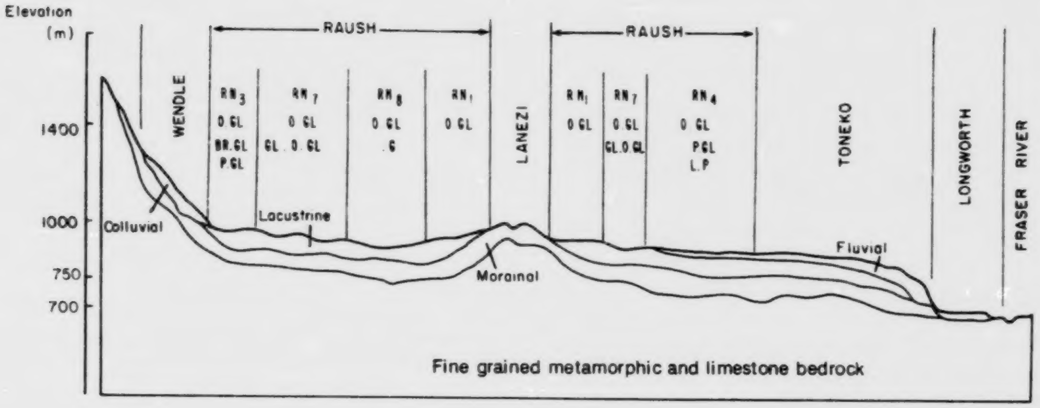
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Bm - brown to dark brown; silty clay
- Ae - brown; silty clay
- AB - yellowish brown; silty clay
- Bt - brown to dark brown; silty clay
- BC - brown to dark brown; silty clay
- CBg - yellowish brown; clay

Raush

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
RH1	Orthic Gray Luvisol		Moderately Well	>100
RH3	Orthic Gray Luvisol		Moderately Well	>100
		Brunisolic Gray Luvisol	Moderately Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
RH4	Orthic Gray Luvisol		Moderately Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
		Luvisolic Humo-Ferric Podzol	Moderately Well	>100
RH7	Orthic Gray Luvisol		Moderately Well	>100
		Gleyed Orthic Gray Luvisol	Imperfectly	>100
RH8	Orthic Gray Luvisol		Moderately Well	>100
		Gleysolic	Poorly	>100

RAUSH SOIL ASSOCIATION


Elevation (m)
1400
1000
750
700
RAUSH
RAUSH
WENDLE
RN3
O.GL
BR.GL
P.GL
RN7
O.GL
GL. O.GL
RN8
O.GL
.G
RN1
O.GL
LANEZI
RN1
O.GL
RN7
O.GL
GL.O.GL
RN4
O.GL
PGL
L.P
TONEKO
LONGWORTH
FRASER RIVER
Colluvial
Lacustrine
Morainal
Fluvial
Fine grained metamorphic and limestone bedrock

Raush soils are physically similar to the Pineview association mapped in the Prince George region. They also conform very closely to the Raush Series as described in the "Soils of the Upper Part of the Fraser Valley", CDA Report No. 10 (Hortie et al., 1970). The Raush association as described herein occurs in a slightly moister section of the Rocky Mountain Trench as compared to the Raush series mapped and described in McBride area.

Raush soils are mapped dominantly in the interior western red cedar - white spruce zone and subdominantly in the interior western hemlock - western red cedar zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture. Moderate to low capability. A cool climate, dense moist to wet soils, erodibility and variable drainage are the main limitations.

Forestry. Moderate capability. A cool, wet climate and dense, cool subsoils which restrict air exchange impose some limitations on forest growth.

Ungulates. Moderate capability for moose. Excessive winter snow depth is also a major limitation. Capability for browse production is high during the early seral stages. A variety of soil drainage classes occur across this landscape which should enhance browse specie diversity.

Recreation. Moderate to very low carrying capacity. Fine textures and moist to wet soils limit the carrying capacity due to the potential for compaction and puddling.

Engineering. Moderate to severe limitations. The naturally moist to wet clayey subsoils impose severe limitations on subgrade construction. Potential frost action, erodibility and inclusions of poorly drained areas which reduce bearing strength all limit engineering activities.

REESOR SOIL ASSOCIATION (RR)*

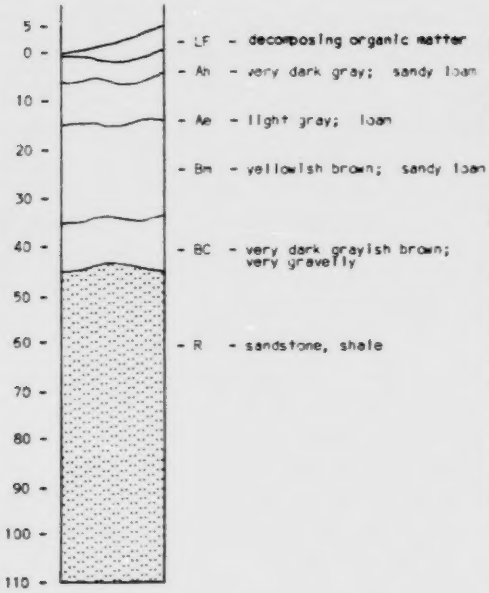
Reesor soils are located in the Rocky Mountain Foothills in the upper subalpine and krummholz subzones, at elevations greater than 1650 m. The parent material consists of gravelly sandy loam to silt loam colluvium which is derived from and overlies sandstone, shale and minor siltstone, conglomerate and coal. The major bedrock lithology throughout the Reesor soil landscape is that of the Minnes Group, with minor inclusions of the Gates and Dunvegan Formations. Reesor soils are often blackish in colour due to the presence of coal. Topography ranges from strong (16-30%) to extreme slopes (46-70%).

Many of the Reesor soils have either undergone or are undergoing periglacial processes such as cryoturbation, nivation and solifluction. These processes, which churn, mix and disrupt the soil, are evident from active and relic patterned ground features such as sorted and nonsorted nets, stripes and occasionally, earth hummocks.

The soil texture and reaction varies across the Reesor landscape. Gravelly sandy loam soils with an extremely acid reaction, occur in areas of subdominant conglomerate bedrock ridges. Sandy loam to silt loam soils, associated with carbonaceous shales, sandstones and coal are also extremely acid in the surface horizons and grade to very strongly acid subsoils. Soils with loamy sand textures developed on colluvium derived from the Dunvegan Sandstone Formation are often weakly calcareous throughout the soil profile. The unusually high carbon contents found in many of the tested soils are due to the presence of substantial amounts of coal particles.

SOIL PROFILE

RR11: Lithic Degraded Dystric Brunisol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LF - decomposing organic matter
- Ah - very dark gray; sandy loam
- Ae - light gray; loam
- Bm - yellowish brown; sandy loam
- BC - very dark grayish brown; very gravelly
- R - sandstone, shale

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
RR1	Orthic Sombric Brunisol		Moderately Well	>50
		Degraded Dystric Brunisol	Moderately Well	>50
RR2	Orthic Sombric Brunisol		Moderately Well	>50
		(Turbic) Orthic Regosol	Moderately Well	>50
RR3	Orthic Sombric Brunisol		Moderately Well	>50
		Degraded Sombric Brunisol	Moderately Well	>50
RR11	Orthic Sombric Brunisol		Moderately Well	>50
		(Turbic) Orthic Regosol	Moderately Well	>50
		Lithic Subgroups	Moderately Well	<50

PLATE 3.5 REESOR SOILS ASSOCIATION (RR)
Colluvial deposits in the Krummholz subzone that occur in the Rocky Mountain Foothills are mapped as RR.
(Photo by Kreg Sky)

Soil development in the Reesor association are quite heterogeneous, often varying greatly over short distances. Nonetheless, the modal soil is considered to be an Orthic Sombric Brunisol; ranging to Degraded Dystric Brunisol (component RR1). It generally occurs in tree island landscapes. Component RR2 occurs in treeless areas which are subject to minor degrees of frost churning. Component RR3 occupies areas of meadows interspersed with pockets of alpine fir. These soils frequently occur on slopes exposed to high winds and rain. The RR11 symbol component includes shallow to bedrock soils which commonly occur on ridges and hummocks; pockets of these soils are subject to active cryoturbation.

Reesor soils are similar to Paisson soils in terms of parent material; the latter however occur upslope in treeless, alpine areas which are prone to extensive periglacial processes.

Reesor soils occur in the Subalpine Engelmann spruce - subalpine fir zone of the Subboreal Region. Stunted Engelmann spruce, lodgepole pine, alpine fir, heather, vaccinium, and crowberry represent the dominant vegetation.

* Refer to Merrick Soil Association for cross-sectional diagram.

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. Adverse climate, periglacial processes and steep slopes preclude agricultural uses.
Forestry.	Very low capability. These soils occur in the krummholz subzone where trees are typically stunted due to extreme climatic conditions.
Ungulates.	Low to moderate capability for moose, caribou, and goats. Excessive winter snow depth in some areas and limited forage quantity are the main limitations.
Recreation.	Low to very low carrying capacity. Periglacial (cold climate) processes and steep slopes are limiting. Surface soil horizons high in organic matter are subject to compaction and erosion, particularly if used intensively.
Engineering.	Moderate to severe limitations. Steepness of slope, erosional processes due to intense frost action are the major limiting factors.

RENSHAW SOIL ASSOCIATION (RN)

Renshaw soils occur in the Rocky Mountains south of Jarvis Creek and to a minor extent on the east flank of the Cariboo Mountains. These youthful soils occur on active fluvial deposits common in many of the major drainages between elevations of 1000 and 1500 m. The floodplain materials consist dominantly of sand and occasionally sandy loam or loam textures in the upper 50 to 100 cm; below these depths gravels and cobbles are common.

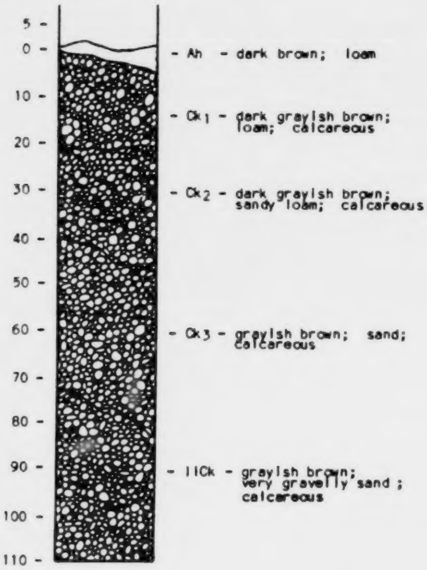
The soils are subject to seasonal flooding and generally contain a fluctuating water table to within 1 m of the soil surface. Standing water exists in many of the oxbows and abandoned meander channels. The very gently sloping topography seldom exceeds 5%. The soils are moderately well drained on the slightly higher terraces and grade to poorly drained in the low lying, depressional sites.

Renshaw soils are found on recently deposited materials and thus lack well defined soil development. Due to the dominating influence of the regional limestone and dolomite bedrock, most of the soils are calcareous to the surface. Non-calcareous soils do exist in some valleys where the fluvial materials originate from quartzite and shale bedrock zones.

Renshaw soils are subject to lateral and surface erosion and seasonal fluvial deposition; as such they are geologically hazardous.

SOIL PROFILE

RN1; Orthic Regosol


5 -
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20 -
30 -
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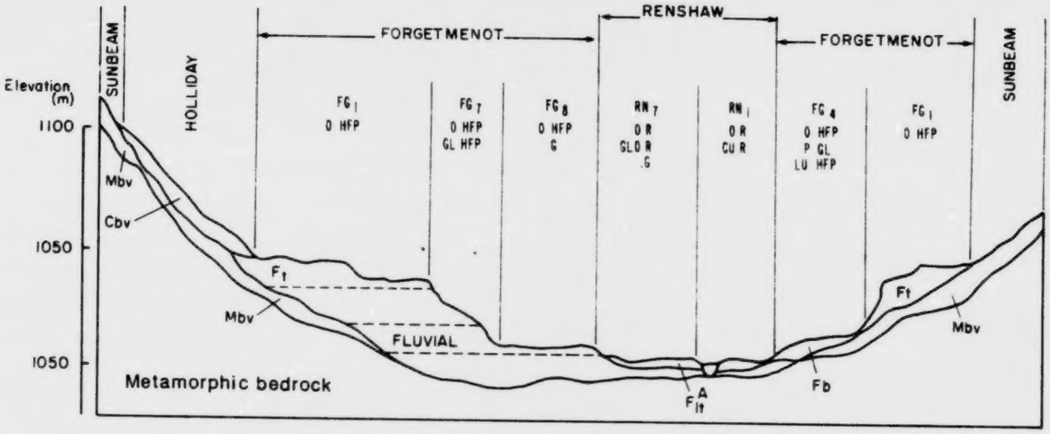
50 -
60 -
70 -
80 -
90 -
100 -
110 -
- Ah - dark brown; loam
- Ck1 - dark grayish brown; loam; calcareous
- Ck2 - dark grayish brown; sandy loam; calcareous
- Ck3 - grayish brown; sand; calcareous
- IICk - grayish brown; very gravelly sand ; calcareous

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
RN1	Orthic Regosol	Cumulic Regosol	Well to Moderately Well	>100
RN7	Orthic Regosol		Moderately Well	>100
		Gleyed Orthic Regosol	Imperfectly	>100
		Gleysolic	Poorly	>100

RENSHAW SOIL ASSOCIATION


RENSHAW
FORGETMENOT
FORGETMENOT
SUNBEAM
HOLLIDAY
SUNBEAM
Elevation (m)
1100
1050
1050
FG1
O HFP
FG7
O HFP
GL HFP
FG8
O HFP
G
RN7
O R
GLO R
.G
RN1
O R
CU R
FG4
O HFP
P GL
LU HFP
FG1
O HFP
Mbv
Cbv
Ft
Mbv
FLUVIAL
Metamorphic bedrock
F A lt
Fb
Ft
Mbv

The RN1 component consists of Orthic Regosols with substantial inclusions of Cumulic Regosols. The nature of the Regosolic development depends upon the position and elevation of the fluvial deposit and the frequency of deposition and erosion. The RN7 component occupies areas with complex drainage pattern and includes abandoned stream channels and meander scrolls which are either imperfectly drained or frequently contain pockets of permanently saturated Gleysolic soils.

Renshaw soils are similar to Knudsen Creek soils, which are also highly calcareous. The latter however occur dominantly in the Subboreal Region on the east side of the Continental Divide while the Renshaw association occurs in the Subalpine Engelmann spruce - subalpine fir zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate and flooding restricts agricultural use.
Forestry.	High to moderate capability for black cottonwood and hybrid spruce.
Ungulates.	Moderate capability for moose. Excessive winter snow depth and the present successional stages of the forest are the major limitations. The moist soils have a high capability for many browse species.
Recreation.	Very low carrying capacity. Flooding and soil erosion can destroy or alter recreational installations.
Engineering.	Severe limitations. Flooding, soil erosion and a high water table pose major limitations to use.

ROBB SOIL ASSOCIATION (RB)

Robb soils occur in the Rocky Mountain Foothills and occasionally the Rocky Mountains, on moderately to strongly sloping topography (9-30%) between 1050 and 1650 m elevation. The parent material is calcareous, gravelly sandy loam to loam cordilleran till which overlies sandstone and other sedimentary bedrock. This association has been previously described in Alberta[1] and that description has been modified for this report.

The soils are generally well drained and moderately pervious. Seepage areas too small to be identified at the scale of mapping occur near the base of many slopes. The soils are usually calcareous within 50 cm of the surface.

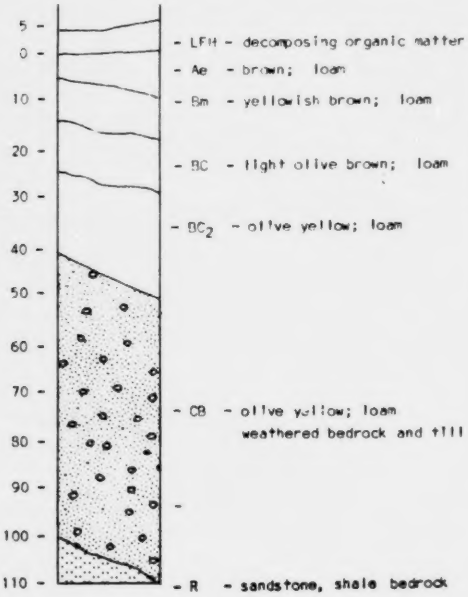
Modal soil development is Degraded Eutric Brunisol. The only soil component mapped in this report area is component RB5 which consists of the modal Degraded Eutric Brunisol with inclusions of Lithic Degraded Eutric Brunisol.

Hambrook and Onion Creek soils have also developed on calcareous cordilleran till, but differ from the Robb soil association in that they have Luvisolic soil development which is more common on the lower elevational compact basal till deposits. A general vertical gradation of soils in the Foothills starts with Hambrook soils at low elevations, then Robb soils, with Turning Mountain soils at the higher elevations.

Robb soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

SOIL PROFILE

RB_1: Degraded Eutric Brunisol


5
0
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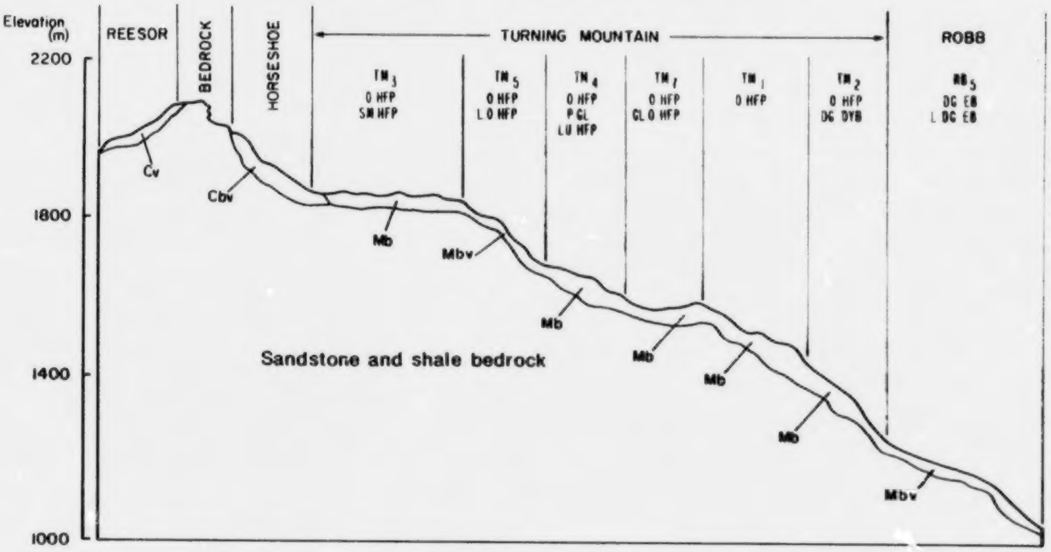
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - brown; loam
- Bm - yellowish brown; loam
- BC - light olive brown; loam
- BC2 - olive yellow; loam
- CB - olive yellow; loam
weathered bedrock and till
- R - sandstone, shale bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
RB5	Degraded Eutric Brunisol		Well	>50
		Lithic Degraded Eutric Brunisol	Well	<50

ROBB AND TURNING MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
2200
1800
1400
1000
REESOR
BEDROCK
HORSESHOE
TURNING MOUNTAIN
ROBB
TM_3 O HFP SM HFP
TM_5 O HFP L O HFP
TM_4 O HFP P GL LU HFP
TM_7 O HFP GL O HFP
TM_1 O HFP
TM_2 O HFP DG DYB
RB_5 DG EB L DG EB
Cv
Cbv
Mb
Mbv
Mb
Mb
Mb
Mb
Mbv
Sandstone and shale bedrock

[1] Soil Survey and Land Evaluation of the Hinton-Edson area. Report No. 31. Alberta Soils Survey, 1972.

COMMENTS ON LAND USE

Agriculture.	Very low capability. The adverse subalpine climate, stoniness and slope are major limitations. Very limited grazing opportunities exist.
Forestry.	Low capability. A short growing season, cold soils and seasonal snowpack limit tree growth.
Ungulates.	Low capability for moose. Excessive winter snow depth and limited forage quantity due to the current mature stages of forest cover are main limitations. Capability for browse production, during the early seral stages, varies from moderate to low, depending upon soil moisture regime.
Recreation.	High to moderate carrying capacity. Steep slopes, seepage sites and areas subject to compaction and restricted surface drainage impose some limits on the carrying capacity.
Engineering.	Slight to severe limitations. The steepness of slope and potential frost action are the major limiting factors. Seepage zones and shallow soils may also impose some limitations to engineering.

SHEBA MOUNTAIN SOIL ASSOCIATION (SB)*

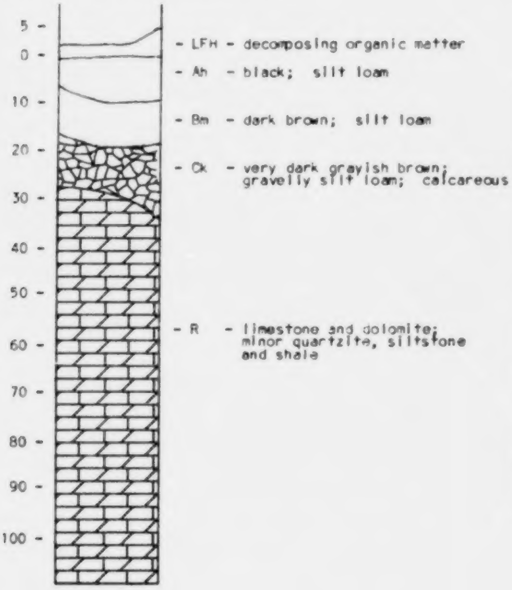
Sheba Mountain soils occur high in the Rocky Mountains at elevations between 1550 to 2000 m. The topography is gently to steeply sloping (6-60%+). The soils have developed from thin deposits of colluvium derived from and overlying limestone and dolomite, with minor inclusions of quartzites, sandstones and shales. The soil texture varies between gravelly sandy loam and gravelly silt loam. The soils have either undergone or are undergoing periglacial processes such as cryoturbation. These processes have resulted in patterned ground features such as sorted and non-sorted nets, stripes and earth hummocks.

The soils are moderately well drained, moderately pervious and usually calcareous within 50 cm of the surface. Many areas are subject to snowpacks which can last throughout the summer.

The variability in soil development within this association is largely due to periglacial processes, slope, and aspect. Modal soil development is Lithic Orthic Melanic Brunisol. The SB1 component may also have inclusions of Degraded Eutric Brunisol and Lithic Degraded Eutric Brunisols. This component occurs mainly in the krummholz subzone which includes areas of dry windswept ridges. The SB3 component occurs in slightly wetter areas where the soils are more stable and some profiles show evidence of podzolization; these soils occur in the upper subalpine tree island landscape. The SB4 component contains a complex pattern of soil development and occurs on the open exposed cryoturbated terrain adjacent to the Alpine Tundra zone that is almost devoid of trees.

SOIL PROFILE

SB_1: Lithic Orthic Melanic Brunisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ah - black; silt loam
- Bm - dark brown; silt loam
- Ck - very dark grayish brown; gravelly silt loam; calcareous
- R - limestone and dolomite; minor quartzite, siltstone and shale

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
SB1	Lithic Orthic Melanic Brunisol		Moderately Well	<50
		(Lithic) Degraded Eutric Brunisol	Moderately Well	<50
SB3	Lithic Orthic Melanic Brunisol		Moderately Well	<50
		Lithic Orthic Humo-Ferric Podzol	Moderately Well	<50
		Lithic Degraded Eutric Brunisol	Moderately Well	<50
SB4	Lithic Orthic Melanic Brunisol		Moderately Well	<50
		(Turbic) Orthic Regosol	Moderately Well	>50
		Turbic Orthic Melanic Brunisol	Moderately Well	>50

Sheba Mt.

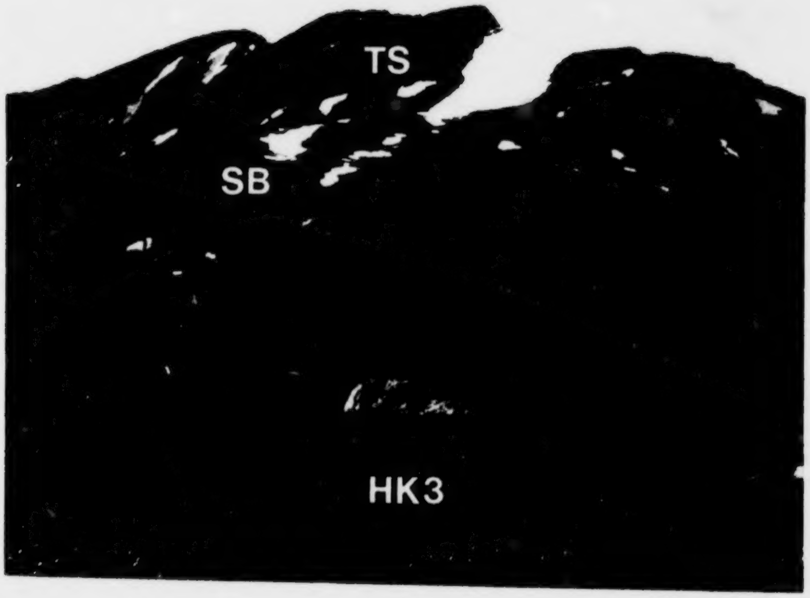


PLATE 3.6 SHEBA MOUNTAIN SOIL ASSOCIATION

Calcareous colluvium in the upper subalpine zone of the Rocky Mountains is mapped as (SB). (Photo by Kreg Sky)

Tsahunga soils are often mapped upslope of Sheba Mountain soils in alpine tundra area where cryoturbation is very active. Hedrick soils are commonly mapped downslope in the forested environments.

Sheba Mountain soils occur in the Subalpine Engelmann spruce - alpine fir zone, krummholz subzone of the Subboreal Region.

* Refer to Tsahunga Association for cross-sectional diagram.

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. Adverse climate, periglacial processes and snowpack preclude agricultural uses.
Forestry.	Very low capability. The severe climate, shallow depth to bedrock and severe frost heaving impose limitations which result in stunted, "krummholz" conifers.
Ungulates.	Low to moderate capability for moose, caribou, and goats. Excessive winter snow depth in much of the area and low forage quantity, are main limitations.
Recreation.	Low to very low carrying capacity. Periglacial processes, steep slopes, and shallowness to bedrock limit carrying capacity.
Engineering.	Severe limitations. Shallow depth to bedrock, steepness of slope and frost action are the limiting factors.

SUNBEAM SOIL ASSOCIATION (SM)

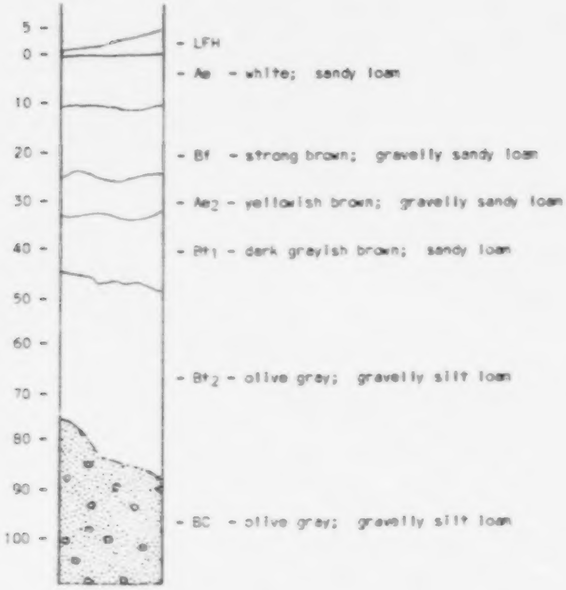
Sunbeam soils occur in the Rocky Mountains and to a minor extent in the Cariboo Mountains between the elevations of 730 to 1200 m. These soils have developed in till which mantles the moderate to very strong slopes (10 to 40%) commonly found throughout the Morkill River watershed. In many areas, the surface of these deposits, to approximately 50 cm depth, is characterized by a stony, loamy, loose matrix similar to colluvium; below this depth, the morainal subsoil is more compact, less pervious and consists of finer textures which range from fine loamy to clayey. The provenance of the moraine includes varying proportions of clasts derived from conglomerate, sandstone, shale, mudstone, phyllite, quartzite and limestone bedrock. The coarse fragment content ranges from 20 to 60% by volume.

Sunbeam soils are usually well to moderately well drained. Gleyed, imperfectly drained inclusions are also common, particularly on lower slopes which transmit relatively large volumes of seepage. The water percolates through the surface horizons, then flows laterally over the relatively impermeable compact till subsoil.

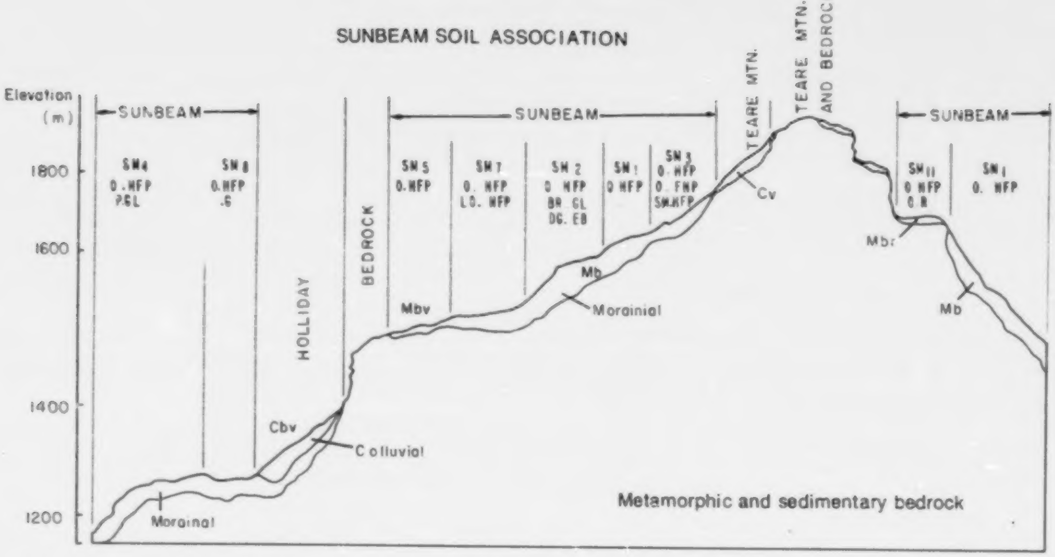
The soils are extremely acid through the surface horizons and, depending upon the calcareousness of the associated bedrock, the subsoil reaction varies from neutral to very strongly acid.

SOIL PROFILE

SM4: Podzolic Grey Luvisol


5 -
0 -
10 -
20 -
30 -
40 -
50 -
60 -
70 -
80 -
90 -
100 -
- LFH
- Ae - white; sandy loam
- Bf - strong brown; gravelly sandy loam
- Ae2 - yellowish brown; gravelly sandy loam
- Bt1 - dark greyish brown; sandy loam
- Bt2 - olive grey; gravelly silt loam
- BC - olive grey; gravelly silt loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
SM1	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
SM2	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Brunisolic Gray Luvisol	Moderately well	>50
		Degraded Eutric Brunisol	Well	>50
SM3	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Orthic Ferro-Humic Podzol	Well to Moderately well	>50
		Sombric Humo-Ferric Podzol	Well to Moderately well	>50
SM4	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Podzolic Gray Luvisol	Moderately well	>50
		Luvisolic Humo-Ferric Podzol	Moderately well	>50
SM5	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Lithic Orthic Humo-Ferric Podzol	Well to Moderately well	>50
SM7	Orthic Humo-Ferric Podzol		Moderately well	>50
		Gleyed Humo-Ferric Podzol	Imperfectly	>50
		Gleyed Brunisolic Gray Luvisol	Imperfectly	>50
SM8	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Gleysolic	Poorly	>50
SM11	Orthic Humo-Ferric Podzol		Well to Moderately well	>50
		Orthic Regosol	Moderately well	>50


SUNBEAM SOIL ASSOCIATION
Elevation (m)
1800
1600
1400
1200
SUNBEAM
SM4 O.HFP P.GL
SM8 O.HFP .G
HOLLIDAY
BEDROCK
SUNBEAM
SM5 O.HFP
SM7 O. HFP LO. HFP
SM2 O HFP BR. GL DG. EB
SM1 O HFP
SM3 O. HFP O. FHP SM.HFP
TEARE MTN.
TEARE MTN. AND BEDROCK
SUNBEAM
SM11 O HFP O.R
SM1 O. HFP
Cv
Mbr
Mb
Mb
Morainial
Mbv
Cbv
Colluvial
Morainal
Metamorphic and sedimentary bedrock

Sunbeam soil development is dominantly Orthic Humo-Ferric Podzol (SM1 component). The SM2 component has associated soil developments of Brunisolic Gray Luvisol and Degraded Eutric Brunisol which occur on the drier, south and southwest facing slopes where stands of Douglas-fir are common. The SM3 component, located at elevations greater than 1600 m, occurs in the mosaic of subalpine meadows and open forest areas which border on the krummholz subzone. This climatically wetter area results in Orthic Ferro-Humic and Sombric Humo-Ferric soil developments. The SM4 soil component is very common in areas of soils with higher clay content; the finer textures result in Podzolic Gray Luvisol and Luvisolic Humo-Ferric Podzol development. Significant inclusions of Lithic soils are indicated by the SM5 component. Areas of seepage and restricted drainage (usually due to the impervious moraine and/or bedrock at depth) resulting in gleyed soils form part of the SM7 component. Component SM8 includes permanently saturated soils that may have up to 60 cm of organic accumulation on the surface. Component SM11 occurs on recent morainal ridges and cirques where some of the soils lack development and may be subject to snow avalanche activity.

The Sunbeam association is commonly mapped in complexes with the Holliday association has developed on deep colluvium. The two associations occur in similar landscapes and are often difficult to distinguish at reconaissance scale of mapping.

The Sunbeam association occurs in the Subalpine Engelmann spruce - alpine fir zone of the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Extremely low to low capability. The subalpine climate, excessive stoniness and steep topography are the dominant limitations.
Forestry.	Moderate to low capability. A short growing season and cold firm subsoils impose limitations on forest growth.
Ungulates.	Low to moderate capability for moose. Excessive winter snow depth, the current mature successional stage of the forest cover and a relatively short growing season limit use. The medium textured, moist soils generally have a moderate capability for browse production during the early seral stages.
Recreation.	Slight to moderate limitations. Steep topography, textures which are somewhat prone to compaction resulting in restricted surface drainage may impose some limits to intensive use.
Engineering.	Moderate limitations. Steep slopes, inclusions of seepage sites with a potentially low bearing capacity for subgrade, and potential frost action impose some constraints to use.

TEARE MOUNTAIN SOIL ASSOCIATION (TE)

Teare Mountain soils occur in the Rocky Mountains south of the McGregor River and also in the Cariboo Mountains at elevations above 1900 m. The parent material is shallow colluvium derived mainly from metamorphic bedrock. Active solifluction, nivation and cryoturbation are occuping and have produced weakly to strongly developed patterned ground. Soil profiles usually exhibit disrupted, mixed and broken horizons; angular stone and gravel fragments (20 to 80% by volume) exist throughout the solum, which is usually less than 50 cm thick over fractured metamorphic bedrock. Slopes range from moderate (10-15%) in areas of meadows, to extreme (46-70%) on rubbly slopes associated with bedrock outcrop.

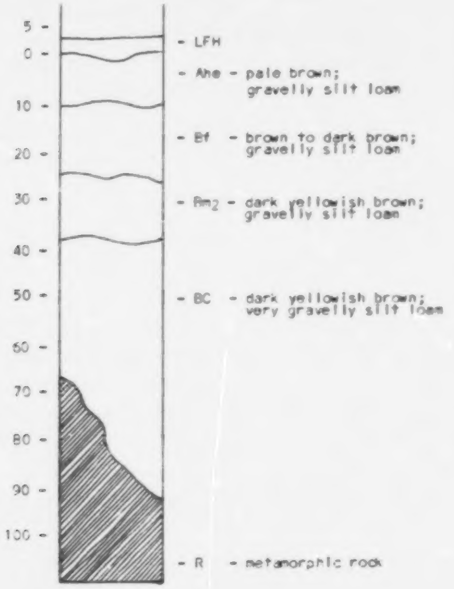
Soil textures range from gravelly silt loam to very gravelly sandy loam; the silt loam textures hold relatively larger amounts of soil water and are the most prone to frost heaving and periglacial modification. The soils are well to moderately well drained and depending upon the reaction of the underlying bedrock, and on the severity of periglacial mixing, pH ranges from extremely acid to mildly alkaline. At several locations ice lens and frozen soils have been identified in the soil profile below 50 cm depth. These cryic horizons occur in deep soils, usually on north facing slopes.

Teare Mountain soils are very variable. It is common for all components of the association to occur in a small area intermingled with scree slopes and bedrock outcrops. The modal soil of the Teare Mountain association is Lithic Turbic Regosol (TE1 component) and occurs on exposed ridges and other similar sites subject to intense frost action. The TE2 component has substantial inclusions of Lithic Orthic Humo-Ferric Podzol; these soils are subject to relatively less intense frost action and usually occur under alpine heather communities. The TE4 component includes soils in damp, depressional meadow sites which are often subject to snowpack accumulation. Here the lush herb growth provides efficient organic matter for the development of Orthic Sombric Brunisols and Sombric Humo-Ferric Podzols.

Teare Mountain soils occur in the Alpine tundra zone of the Interior Wet Belt Region.

SOIL PROFILE

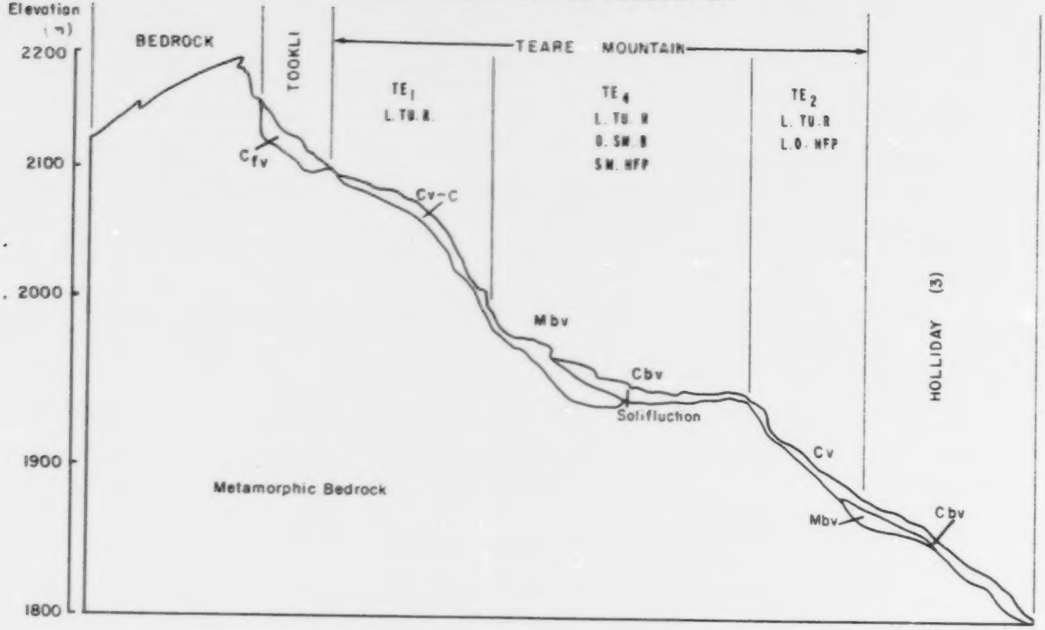
TE2: Lithic Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH
- Ahe - pale brown; gravelly silt loam
- Bf - brown to dark brown; gravelly silt loam
- Bm2 - dark yellowish brown; gravelly silt loam
- BC - dark yellowish brown; very gravelly silt loam
- R - metamorphic rock

Teare Mt.

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TE1	Lithic Turbic Regosol		Well to Moderately Well	<50
TE2	Lithic Turbic Regosol		Well to Moderately Well	<50
		Lithic Orthic Humo-Ferric Podzol	Well to Moderately Well	<50
TE4	Lithic Turbic Regosol		Moderately Well	<50
		Orthic Sombric Brunisol	Moderately Well	50-100
		Sombric Humo-Ferric Podzol	Moderately Well	50-100

TEARE MOUNTAIN SOIL ASSOCIATION


Elevation (m)
2200
2100
2000
1900
1800
BEDROCK
TOOKLI
TEARE MOUNTAIN
TE$_1$
L.TU.R.
TE$_4$
L.TU.R
O.SM.B
SM.HFP
TE$_2$
L.TU.R
L.O.HFP
HOLLIDAY (3)
C$_{fv}$
Cv-C
Mbv
Cbv
Solifluction
Cv
Mbv
Cbv
Metamorphic Bedrock

COMMENTS ON LAND USE

Agriculture. Extremely low capability. The severe alpine climate, steep topography, excessive stoniness and shallow soils preclude agricultural uses.

Forestry. Extremely low capability. The alpine climate prohibits forest growth.

Ungulates. Low to moderate capability for caribou. Forage capability is highly variable across this landscape, seepage sites, meadows and riparian sites appear to provide the highest productivity.

Recreation. Severe to moderate limitations. Steep slopes and frost action impose limits on recreational installations.

Engineering. Severe limitations. Intense frost action, steep slopes and shallow to bedrock soils impose severe limitations on use.

THUNDER MOUNTAIN SOIL ASSOCIATION (TH)

Thunder Mountain soils occur in the Rocky Mountain Foothills on gently to strongly sloping (5-30%) topography between 1050 and 1650 m elevation. The soils have developed on shallow, noncalcareous glacial till derived mainly from the underlying sandstone and shale bedrock. The texture is gravelly sandy loam to loam; the soil reaction is strongly acid.

Thunder Mountain soils are mostly well drained with substantial inclusions of moderately well or imperfectly drained areas. The soils are moderately pervious and have a moderate moisture-holding capacity. The subsoil clay accumulation layer is usually strongly developed.

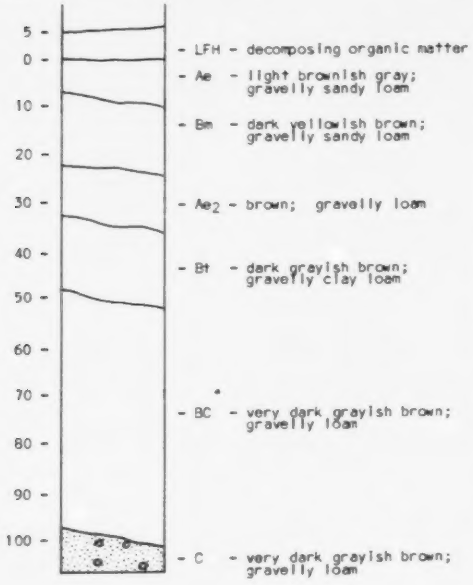
The dominant soil development is Brunisolic Gray Luvisol. The TH5 component has inclusions of lithic soils while the TH6 component consists of a dominance of lithic soils. The TH7 component includes gleyed soils subject to seepage.

Hambrock and Onion Creek soils have similar soil development, but have developed on a finer textured, calcareous glacial till.

Thunder Mountain soils are located in the Subalpine Engelmann spruce - alpine fir zone of the Subboreal Region.

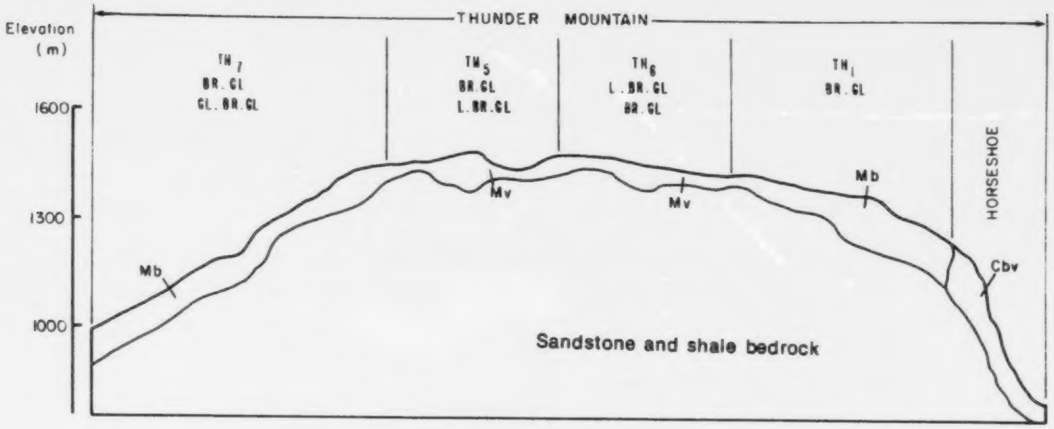
SOIL PROFILE

TH_1; Brunisolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - light brownish gray; gravelly sandy loam
- Bm - dark yellowish brown; gravelly sandy loam
- Ae2 - brown; gravelly loam
- Bt - dark grayish brown; gravelly clay loam
- BC - very dark grayish brown; gravelly loam
- C - very dark grayish brown; gravelly loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TH5	Brunisolic Gray Luvisol		Well	>50
		Lithic Brunisolic Gray Luvisol	Well to Moderately Well	<50
TH6	Lithic Brunisolic Gray Luvisol		Well to Moderately Well	<50
		Brunisolic Gray Luvisol	Well to Moderately Well	>50
TH7	Brunisolic Gray Luvisol		Well to Moderately Well	>50
		Gleyed Brunisol Gray Luvisol	Imperfectly	>50

THUNDER MOUNTAIN SOIL ASSOCIATION


Elevation (m)
1600
1300
1000
THUNDER MOUNTAIN
TH7
BR.GL
GL.BR.GL
TH5
BR.GL
L.BR.GL
TH6
L.BR.GL
BR.GL
TH1
BR.GL
HORSESHOE
Mb
Mv
Mv
Mb
Cbv
Sandstone and shale bedrock

COMMENTS ON LAND USE

Agriculture. Very low capability. The adverse subalpine climate, steep topography and stoniness are major limitations to agriculture.

Forestry. Low capability. A short growing season, and possible moisture deficiencies are limiting.

Ungulates. Low capability for moose. Currently low forage quantity due to the mature forest cover and the excessive winter snow depths are the main limitations. The deep, moist, medium textured soils should have a moderate capability for browse production during the early seral stages.

Recreation. High to moderate carrying capacity. Areas are subject to compaction and puddling as well as steep slopes may be slightly limiting.

Engineering. Slight to severe limitations. Steepness of slope and frost action are limiting factors.

TLOOKI SOIL ASSOCIATION (OO)

Tlooki soils occur in the Rocky Mountains, specifically the Dezlako and Park Ranges, on the west side of the Continental Divide at elevations between 1000 and 1900 m. The topography is very strongly to extremely sloping (>30%) and the areas are often subject to snow avalanching. Tlooki soils have developed on rubbly colluvial fans and talus cones derived from non-calcareous and calcareous metamorphic and sedimentary bedrock. Soil textures vary widely and range from very gravelly loam to angular gravels, cobbles and stones with relatively no matrix of finer materials.

Tlooki soils are rapidly drained, very porous, and have a low moisture holding capacity.

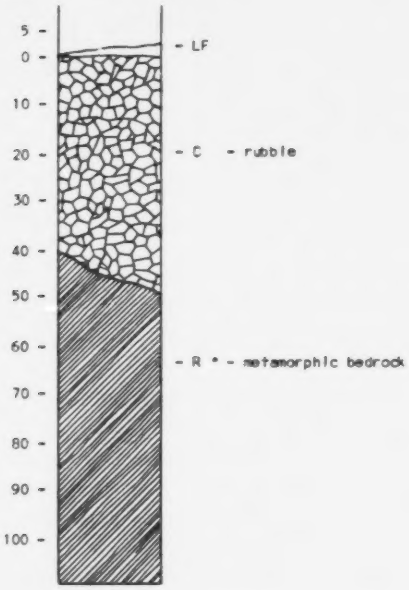
The soils are dominantly Orthic Regosols (001 component). At most locations the active downslope movement of rubble and the absence of fine particles prevent B horizon development. The 006 soil component occurs where the depth of soil is dominantly less than 50 cm over bedrock.

Tlooki and Becker Mountain soils are texturally similar, however the latter soils are derived dominantly from limestone and dolomite bedrock. Dezalko, Holliday and Teare Mountain soil associations are often mapped in association with Tlooki soils.

Although Tlooki soils occur in the Subalpine Engelmann spruce - alpine fir zone of the Interior Wet Belt Region, they are typically unforested. Vegetation consists of a sparse cover of lichens and shrubs.

SOIL PROFILE

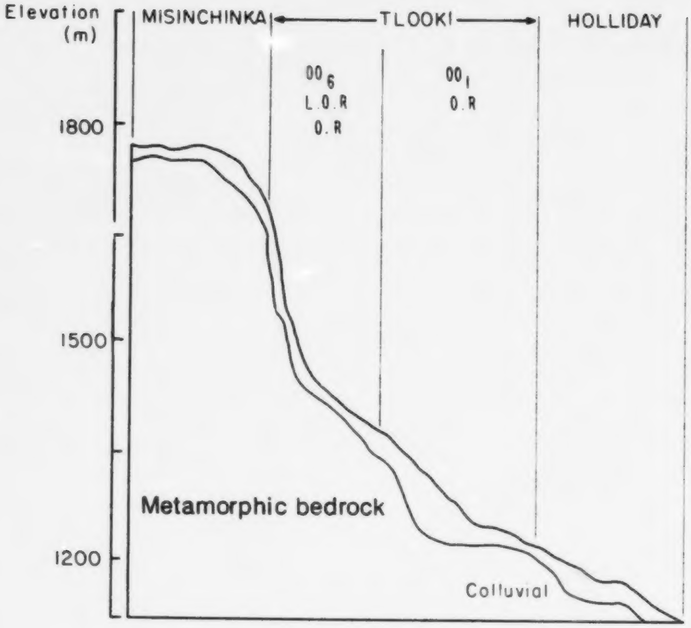
006: Lithic Orthic Regosol



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
001	Orthic Regosol		Rapidly	>50
006	Lithic Orthic Regosol		Rapidly	<50
		Orthic Regosol	Rapidly	>50

Tlooki

TLOOKI SOIL ASSOCIATION


Elevation (m)
MISINCHINKA
TLOOKI
HOLLIDAY
00_6
L.O.R
O.R
00_1
O.R
1800
1500
1200
Metamorphic bedrock
Colluvial

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. Adverse alpine and subalpine climate along with excessive slopes and stoniness preclude agricultural uses.
Forestry.	Very low capability. The active colluvial deposits are excessively stony, droughty, and often too unstable for tree establishment.
Ungulates.	Low capability for goats. Very low forage capability potential due to coarse textured soils with a very low moisture holding capacity limit ungulate use.
Recreation.	Low to very low carrying capacity. Steep slopes and the excessively coarse rubbly textures limit most types of recreational use.
Engineering.	Severe limitations. Steep slopes, unstable materials and snow avalanching impose major limitations to use.

TONEKO SOIL ASSOCIATION (TO)

Toneko soils occur dominantly in the Rocky Mountain Trench and occasionally in the Rocky Mountains, between the elevations of 730 to 1200 m. The soils have developed on noncalcareous, medium to coarse sandy glaciofluvial and fluvial deposits on the upper terraces along the Fraser River, in an area extending from Upper Fraser to McBride.

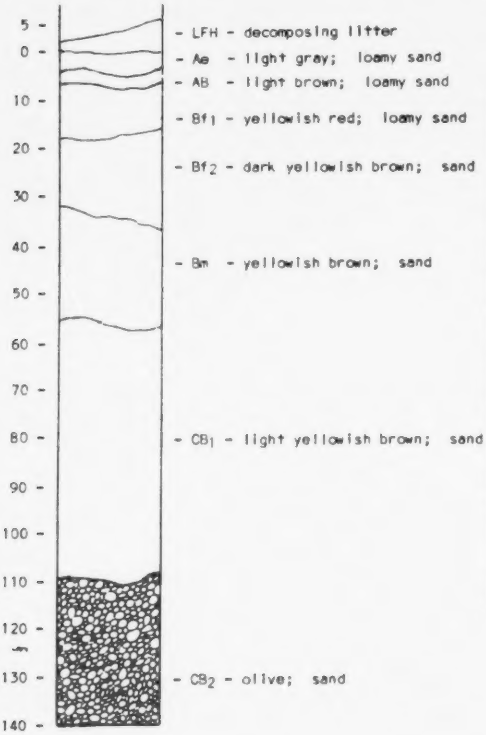
These sandy materials may overlie till or lacustrine sediments at depths greater than 1 m. The deepest (over 100 m thick) occur along the major escarpments of the Fraser River while the shallowest occur upslope on the subdued lacustrine sediments. The deeper deposits continue to be modified by fluvial processes which have created variable slopes and gullies ranging from 5 to 60%. The thin sandy overlays, also subject to minor fluvial modification, exist on the more subdued topography which ranges from 1 to 9% slope.

Toneko soils are very prone to water erosion; particularly on the steeper slopes and where sandy veneers overlie lacustrine. Slope failures are relatively common on the steeper escarpments. Seepage and perched watertables on the less permeable underlying material are common, particularly where the sandy overlay is relatively shallow.

The soils are generally well drained, have slow runoff, rapid internal drainage and low water-holding capacity. They are very strongly acid and low in organic matter and plant nutrients.

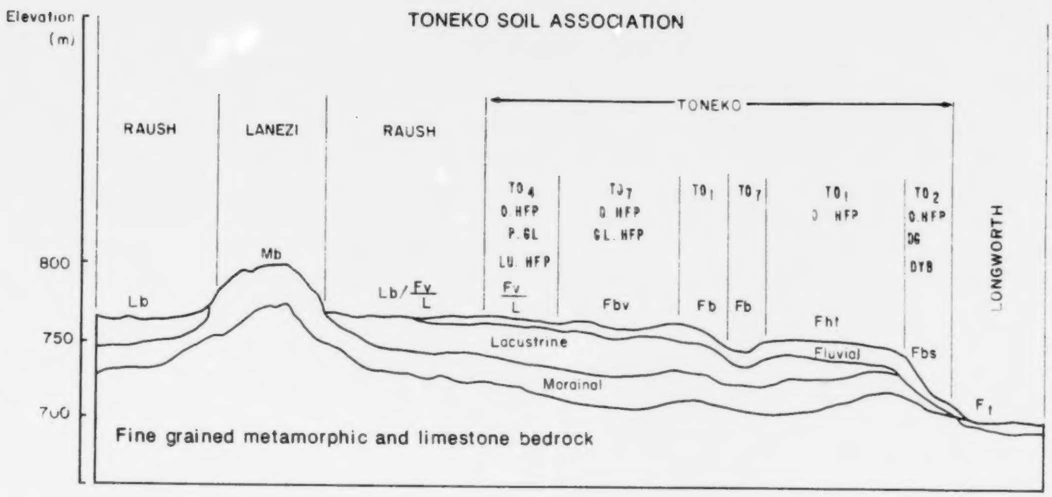
SOIL PROFILE

TO1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
- LFH - decomposing litter
- Ae - light gray; loamy sand
- AB - light brown; loamy sand
- Bf1 - yellowish red; loamy sand
- Bf2 - dark yellowish brown; sand
- Bm - yellowish brown; sand
- CB1 - light yellowish brown; sand
- CB2 - olive; sand

Toneko

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TO1	Orthic Humo-Ferric Podzol		Well	>100
TO2	Orthic Humo-Ferric Podzol		Well	>100
		Degraded Dystric Brunisol	Well	>100
TO4	Orthic Humo-Ferric Podzol		Well	>100
		Podzolic Gray Luvisol	Moderately Well	>100
		Luvisolic Humo-Ferric Podzol	Moderately Well	>100
TO7	Orthic Humo-Ferric Podzol		Well	>100
		Gleyed Humo-Ferric Podzol	Imperfectly	>100


Elevation (m)
TONEKO SOIL ASSOCIATION
RAUSH
LANEZI
RAUSH
TONEKO
TO4
O.HFP
P.GL
LU.HFP
TO7
O.HFP
GL.HFP
TO1
TO7
TO1
O.HFP
TO2
O.HFP
DG
DYB
LONGWORTH
800
750
700
Lb
Mb
Lb/Fv/L
Fv/L
Fbv
Fb
Fb
Fht
Fbs
Ft
Lacustrine
Fluvial
Morainal
Fine grained metamorphic and limestone bedrock

Toneko soils are dominantly Orthic Humo-Ferric Podzols (TO1 component), and occur where the sandy deposits are deep. The TO2 component is mapped on the steeper slopes of the major terrace escarpments where surface ravelling and slumping have sometimes retarded soil development to Degraded Dystric Brunisol. The TO4 component includes areas having a 50 to 100 cm fluvial capping of sandy loam to silt loam, over silty clay to clay lacustrine subsoil. These finer textured surfaces provides an opportunity for bands of subsoil clay accumulation resulting in Podzolic Grey Luvisols and Luvisolic Humo-Ferric Podzols. The TO4 component occupies a transition to the Raush soil association (component RH4). Component TO7 includes areas where drainage restrictions (usually due to the underlying lacustrine) result in gleyed soils.

Toneko soils are also described in "Biophysical Soil Resources and Land Evaluation of the northeast coal study area 1976-1977, Volume Two" (Vold et al., 1977) and "Soils of the Upper Part of the Fraser Valley", Report No. 10 (Hortie et al., 1970).

Toneko soils occur dominantly in the interior western red cedar - white spruce zone, and to a lesser extent in the interior western hemlock - western red cedar forest zone; both zones are in the Interior Wet Belt Region. In Dawson (in preparation) they have also been described and mapped in the Subboreal white spruce - alpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture.	Generally low capability with some inclusions of moderate ratings. Steep topography in some areas and potential moisture deficits are the major limitations.
Forestry.	Moderate to high capability. Low moisture holding capacity in some areas may result in moisture deficiencies.
Ungulates.	Moderate capability for moose. Excessive snow depth and the current successional states of the forest which limits browse production for moose are the major restrictions to use. Depending upon the depth of sands over the moist silty subsoil, the browse production will vary from moderate to high during the early seral stages.
Recreation.	Slight to severe limitations. Steep, sandy, erodible slopes limit recreational use.
Engineering.	Slight to severe limitations. Steep topography, slope stability, frost action and presence of finer textured subsoils in some areas are some major limitations.

TORRENS SOIL ASSOCIATION (TR)

Torrens soils occur in the Rocky Mountain Foothills southeast of the Narraway River between 1250 to 2000 m in elevation. The soils have developed on loose, angular colluvium derived mainly from Jurassic and Cretaceous sediments known as the Minnes group, with minor inclusions of the Upper Cretaceous Dunvegan Formation. The former group includes fine grained sandstone with some carbonaceous sandstone, siltstone and shale while the latter is mostly sandstone with minor conglomerate and shale. The slopes are generally greater than 20% and range in length from 100 m to 500 m.

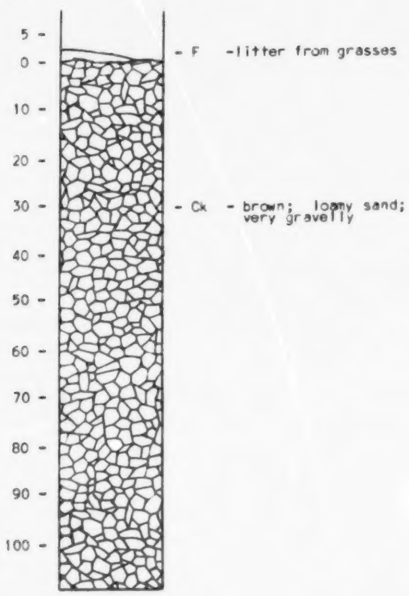
Most areas of Torrens soils are subject to continuous creep and slope failures may result if these materials are dissected during road construction.

Soil textures range from very gravelly sandy loam to very gravelly loamy sand. The soil reaction varies depending upon the local bedrock lithology. The soil matrix is loose and porous, the permeability is generally rapid, and the soil is usually well to rapidly drained. The soils are potentially droughty throughout the drier periods of the growing season.

The modal soil (TR1) lacks strong development due to the actively eroding nature of the deposits, hence Orthic Regosols and Orthic Eutric Brunisols are the dominant soils. The TR5 component has inclusions of shallow to bedrock soils and actively eroding scree slopes often subject to gullying. The TR6 component consists dominantly of shallow soils occurring on eroding scree slopes and wind-swept ridges located at higher elevations.

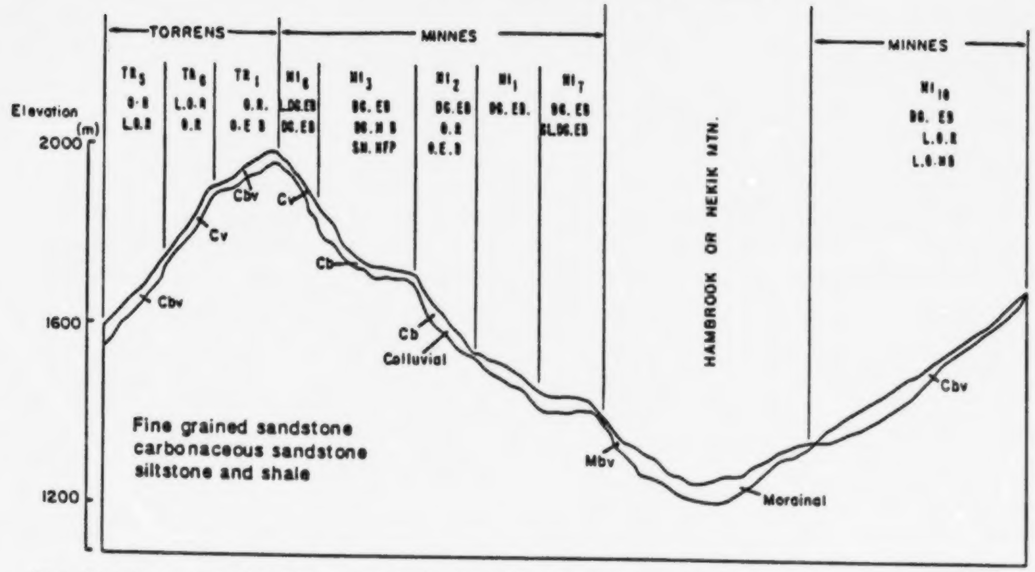
SOIL PROFILE

TR1: Orthic Regosol



Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TR1	Orthic Regosol	Orthic Eutric Brunisol	Rapidly	>50
TR5	Orthic Regosol		Rapidly	>50
		Lithic Orthic Regosol	Rapidly	<50
TR6	Lithic Orthic Regosol		Rapidly	<50
		Orthic Regosol	Rapidly	>50

MINNES AND TORRENS SOIL ASSOCIATIONS


TORRENS
MINNES
MINNES
TR5
O.R
L.O.R
TR6
L.O.R
O.R
TR1
O.R.
O.E.B
MI6
L.DG.EB
DG.EB
MI3
DG.EB
DG.HB
SM.HFP
MI2
DG.EB
O.R
O.E.B
MI1
DG.EB.
MI7
DG.EB
GL.DG.EB
MI10
DG.EB
L.O.R
L.O.HB
Elevation (m)
2000
1600
1200
Cbv
Cv
Cbv
Cv
Cb
Cb
Colluvial
Mbv
Morainal
Cbv
HAMBROOK OR NEKIK MTN.
Fine grained sandstone
carbonaceous sandstone
siltstone and shale

The Torrens association occurs dominantly in the Subalpine Engelmann spruce - alpine fir zone and subdominantly in the Alpine Tundra zone, of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture. Low capability. The subalpine climate and loose, erodible, droughty soils are the major limitations.

Forestry. Low capability. The short growing season and erodible, droughty soils limit the capability.

Ungulates. Moderate to high capability for caribou; high capability for sheep. Forage capability is variable, with production depending upon soil texture and the soil moisture regime. Browse capability for moose would be generally low, due to lower soil moisture contents with local seepage areas producing a moderate cover.

Recreation. Very low carrying capacity. Steep slopes and erodible soils impose limits on the carrying capacity.

Engineering. Severe limitations. The rating is due to steep slopes and erodible soils subject to failure.

TSAHUNGA SOIL ASSOCIATION (TS)

Tsahunga soils occur high in the Rocky Mountains above 1650 m elevation on moderate to extremely sloping topography (greater than 9%). The soils have developed on gravelly silt loam to very gravelly sandy loam mostly shallow colluvium derived primarily from limestone and dolomite bedrock, but occasionally from sandstone, shale, quartzite, or conglomerate. These soils are subject to periglacial processes such as cryoturbation, nivation, and solifluction.

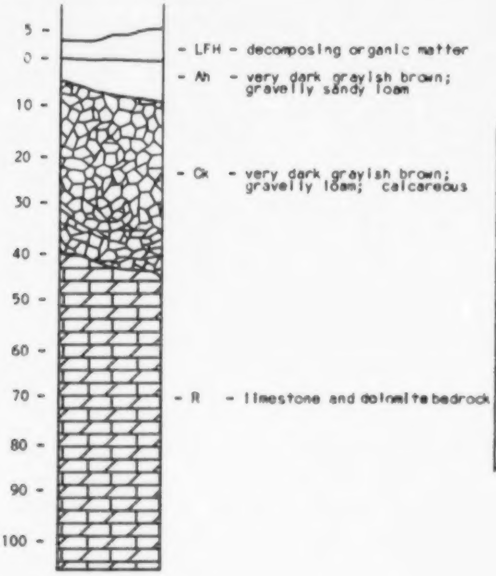
Tsahunga soils are mildly alkaline due to the calcareous bedrock. The variability in slope, aspect, snow pack and texture produce a wide range of micro and meso sites throughout this landscape. Consequently soil development is also complex and variable.

The modal soils (component TS1) are Lithic Orthic Regosols, with inclusions of Lithic Orthic Turbic Regosols. The soils are usually less than 50 cm to bedrock. The TS4 component occurs in complex alpine areas; here the soils are usually less than 1 m thick over bedrock, are subject to cryoturbation, and include pockets of alpine meadows with Turbic Orthic Melanic Brunisols.

The calcareous nature of the Tsahunga soils distinguishs them from the acidic Palsson and Gable Mountain soils. Sheba Mountain soils which occur in the krummholz subzone are often mapped downslope of Tsahunga soils.

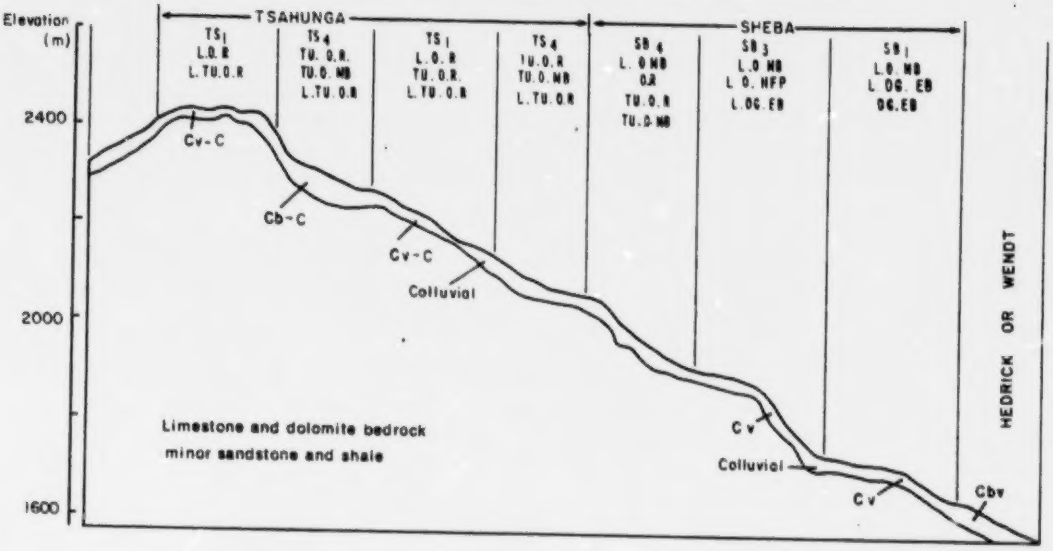
SOIL PROFILE

TS1: Lithic Orthic Regosol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ah - very dark grayish brown; gravelly sandy loam
- Ck - very dark grayish brown; gravelly loam; calcareous
- R - limestone and dolomite bedrock

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TS1	Lithic Orthic Regosol		Moderately Well	<50
		Lithic Turbic Regosol	Moderately Well	<50
TS4	Turbic Orthic Regosol		Moderately Well	>50
		Lithic Turbic Regosol	Moderately Well	<50
		Turbic Orthic Melanic Brunisol	Moderately Well	>50

TSAHUNGA AND SHEBA MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
2400
2000
1600
TSAHUNGA
SHEBA
TS1 L.O.R L.TU.O.R
TS4 TU.O.R. TU.O.MB L.TU.O.R
TS1 L.O.R TU.O.R. L.TU.O.R
TS4 TU.O.R TU.O.MB L.TU.O.R
SB4 L.O.MB O.R TU.O.R TU.O.MB
SB3 L.O.MB L.O.HFP L.OG.EB
SB1 L.O.MB L.OG.EB OG.EB
Cv-C
Cb-C
Cv-C
Colluvial
Limestone and dolomite bedrock
minor sandstone and shale
Cv
Colluvial
Cv
Cbv
HEDRICK OR WENDT

Tsahunga soils occur in the Alpine tundra zone of the Subboreal Region and to a minor extent in the Interior Wet Belt Region. Heather, vaccinium, mosses, and lichen are some of the dominant plant species.

COMMENTS ON LAND USE

Agriculture.	Extremely low capability. The adverse alpine climate, frost action , stoniness, and steep slopes preclude agricultural uses.
Forestry.	Extremely low capability. The alpine climate, frost heaving and shallow soils prevent tree establishment.
Ungulates.	Low to moderate capability for goats and caribou. Excessive snow depths and in some locations, low forage quantity are significant limitations. Forage production improves on local sites subject to seepage and/or stream influence.
Recreation.	Very low carrying capacity. Local seepage sites (due to melting snow pack), intense frost action, shallow soils and steep slopes all impose limits on the carrying capacity.
Engineering.	Severe limitations. Shallow depth to bedrock, steepness of slope and intense frost action all impose limits on engineering uses.

TURNING MOUNTAIN SOIL ASSOCIATION (TM)

Turning Mountain soils are located in the Rocky Mountain Foothills on forested slopes between Belcourt and Ptarmigan Mountains at elevations between 1050 and 1650 m. The parent material is gravelly sandy loam to loam glacial till which occurs on gently to strongly sloping topography (6-30%). The till appears to be primarily derived from sandstone, shale and conglomerate bedrock although inclusions derived from limestone and dolomite can be expected. The total coarse fragment content ranges from about 20 to 60% by volume.

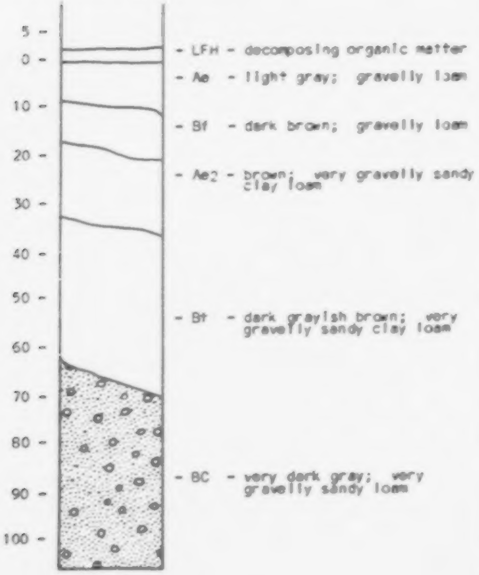
Turning Mountain soils are well drained, porous, and have a moderate moisture holding capacity. They are usually moist throughout the summer. They are also extremely acid throughout the solum and usually calcareous below 100 cm depth. The surfaces are loose, relatively well weathered and are subject to surface creep on slopes >20%.

The modal soil development is Orthic Humo-Ferric Podzol (component TM1). The TM2 component occurs in drier environments where inclusions of Brunisolic soils have developed. This component often borders on the Robb soil association. The TM3 component occurs at higher elevations bordering the krummholz subzone. Here the lush herb growth, which occurs in meadow sites between the tree islands, promotes a dark organic matter enriched (Ah) surface horizon. The TM4 component occupies areas with inclusions of finer textured (silt loam to loam) soils with Luvisolic soil development. The TM5 component indicates areas which have significant inclusions of Lithic soils. Component TM7 occupies areas where restricted drainage and seepage result in inclusions of gleyed soils.

Turning Mountain soils occur in the Subalpine Engelmann spruce - alpine fir forest zone of the Subboreal Region.

SOIL PROFILE

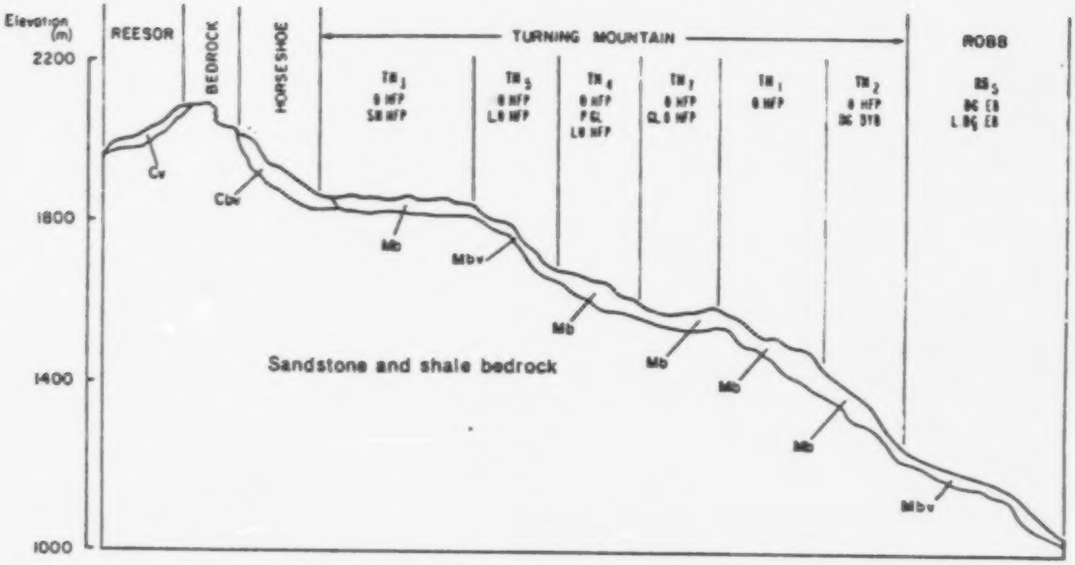
TM4: Podzolic Gray Luvisol


5
0
10
20
30
40
50
60
70
80
90
100
- LFH - decomposing organic matter
- Ae - light gray; gravelly loam
- Bf - dark brown; gravelly loam
- Ae2 - brown; very gravelly sandy clay loam
- Bt - dark grayish brown; very gravelly sandy clay loam
- BC - very dark gray; very gravelly sandy loam

Turning Mountain

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
TM1	Orthic Humo-Ferric Podzol		Well	>50
TM2	Orthic Humo-Ferric Podzol		Well	>50
		Degraded Dystric Brunisol	Well	>50
TM3	Orthic Humo-Ferric Podzol		Well	>50
		Sombric Humo-Ferric Podzol	Well	>50
TM4	Orthic Humo-Ferric Podzol		Well	>50
		Podzolic Gray Luvisol	Well	>50
		Luvisolic Humo-Ferric Podzol	Well	>50
TM5	Orthic Humo-Ferric Podzol		Well	>50
		Lithic Orthic Humo-Ferric Podzol	Well	<50
TM7	Orthic Humo-Ferric Podzol		Well	>50
		Gleyed Orthic Humo-Ferric Podzol	Imperfectly	>50

ROBB AND TURNING MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
2200
1800
1400
1000
REESOR
BEDROCK
HORSESHOE
TURNING MOUNTAIN
ROBB
TM3
O HFP
SB HFP
TM5
O HFP
LU HFP
TM4
O HFP
PGL
LU HFP
TM7
O HFP
GL.O HFP
TM1
O HFP
TM2
O HFP
DG DYB
RB5
DG EB
L DG EB
Cv
Cbv
Mb
Mbv
Mb
Mb
Mb
Mb
Mbv
Sandstone and shale bedrock

COMMENTS ON LAND USE

Agriculture.	Very low capability. Adverse subalpine climate, usually steep slopes and stoniness are major limitations to agriculture.
Forestry.	Low capability. A short growing season and due snowpack are the main limitations.
Ungulates.	Low capability for moose. Excessive winter snow depths and limited forage quantity due to the mature stage of forest cover limit use. The soils should have a moderate browse capability during the early seral stages.
Recreation.	High to moderate carrying capacity. Steepness of slope and the occurrence of seepage sites limits use.
Engineering.	Slight to severe limitations. Steepness of slope and frost action are the limiting factors.

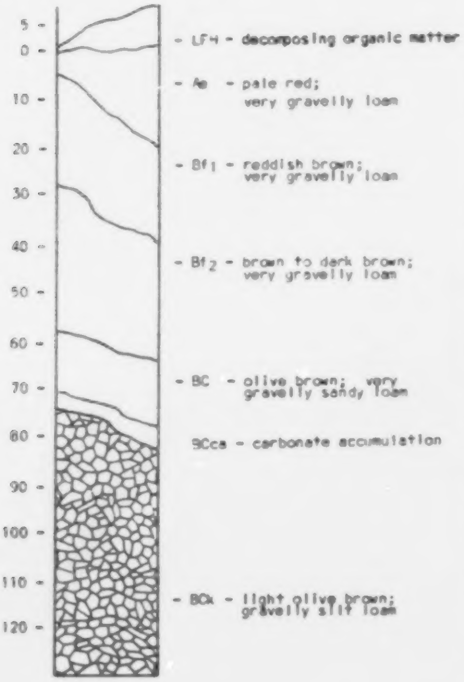
WENDLE SOIL SOIL ASSOCIATION (WD)

Wendle soils occur in the Rocky Mountain Trench, and to a lesser extent, on the McGregor Plateau and Rocky Mountains between the elevational limits of 700 and 1000 m. They are located on strong to extreme topography (16 to 70%), which includes lower mountain slopes and to a lesser extent knolls, bedrock drumlins and eroding escarpments. The soils are developed in usually shallow colluvium which consists dominantly of weathered acidic to basic metamorphic and sedimentary bedrock often containing some eroded morainal materials. Colluvium derived from occasional limestone areas in the Trench are also included. The colluvium material is loose, contains numerous angular rock fragments, and varies in depth.

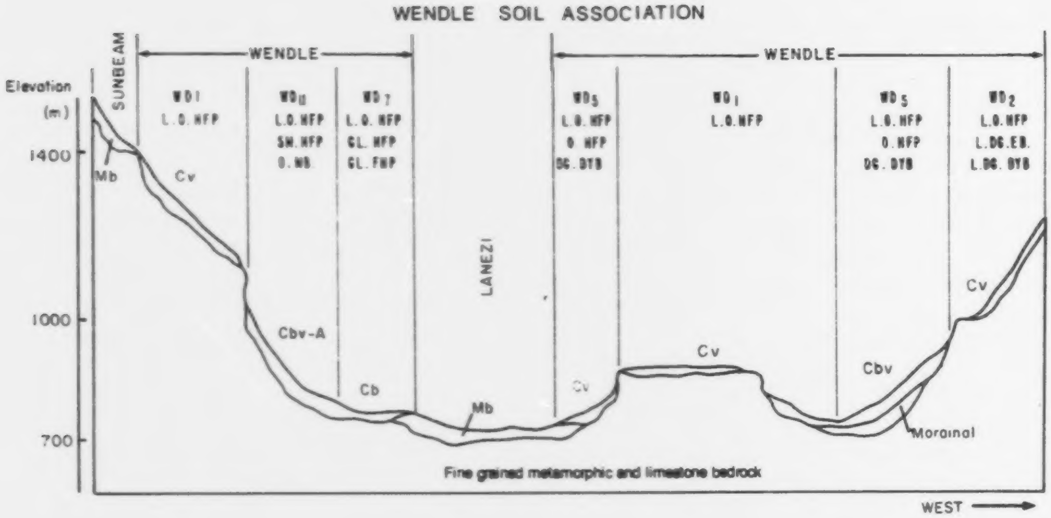
Soil textures vary from very gravelly loam to gravelly silt loam. The coarse textures are usually associated with conglomerate, sandstone and limestone while the finer textures occur in areas of shale, mudstone and phyllite. The reaction of the upper solum ranges from very strongly acid to medium acid while the lower solum is usually weakly calcareous near the bedrock contact. The soils are well to moderately well drained, generally well aerated, and many sites transmit and receive lateral seepage.

SOIL PROFILE

WD1: Orthic Humo-Ferric Podzol


5
0
10
20
30
40
50
60
70
80
90
100
110
120
- LFH - decomposing organic matter
- Ae - pale red; very gravelly loam
- Bf1 - reddish brown; very gravelly loam
- Bf2 - brown to dark brown; very gravelly loam
- BC - olive brown; very gravelly sandy loam
9Cca - carbonate accumulation
- BCk - light olive brown; gravelly silt loam

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
WD1	Lithic Orthic Humo-Ferric Podzol		Well	<50
WD2	Lithic Orthic Humo-Ferric Podzol		Well	<50
		Lithic Degraded Eutric Brunisol; Lithic Degraded Dystric Brunisol	Well	<50
WD5	Lithic Orthic Humo-Ferric Podzol		Well	<50
		Orthic Humo-Ferric Podzol; Degraded Dystric Brunisol	Well	>50
WD7	Lithic Orthic Humo-Ferric Podzol		Moderately Well	<50
		Gleyed Humo-Ferric Podzol; Gleyed Ferro-Humic Podzol	Imperfect	50-100
WD11	Lithic Orthic Humo-Ferric Podzol		Moderately Well	<50
		Sombric Humo-Ferric Podzol; Orthic Melanic Brunisol	Moderately Well	50-100


WENDLE SOIL ASSOCIATION
SUNBEAM
WENDLE
WENDLE
Elevation (m)
1400
1000
700
WD1
L.O.HFP
WD11
L.O.HFP
SM.HFP
O.MB.
WD7
L.O.HFP
GL.HFP
GL.FHP
LANEZI
WD5
L.O.HFP
O.HFP
DG.DYB
WD1
L.O.HFP
WD5
L.O.HFP
O.HFP
DG.DYB
WD2
L.O.HFP
L.DG.EB.
L.DG.DYB
Mb
Cv
Cbv-A
Cb
Mb
Cv
Cv
Cbv
Cv
Morainal
Fine grained metamorphic and limestone bedrock
WEST

The dominant soil development is Lithic Orthic Humo-Ferric Podzol (WD1 component). The WD2 component includes Lithic Degraded Eutric Brunisols and Lithic Degraded Dystric Brunisols and occurs on the drier and warmer, south and southwest facing slopes where stands of Douglas-fir are common. Soils which have lithic contacts at greater than 50 cm of the surface are included in WD5. Component WD7 includes moist soils subject to gleying and mottling caused mostly by seepage and are common at the base of colluvial fans and long seepage slopes. The WD11 component includes Sombric Humo-Ferric Podzols and Orthic Melanic Brunisols. These are located on treeless slopes subject to snow avalanching.

The Wendle soil association is usually mapped in conjunction with the Lanezi association that has developed on glacial till. Wendle soils conform closely to the Bearpaw Ridge soils as mapped and described in "Soils of the Barkerville Area" (Lord, at press).

Wendle soils occur dominantly in the interior western hemlock - western red cedar zone and subdominantly in the interior western red cedar - white spruce zone, both zones occurring in the Interior Wet Belt Region.

COMMENTS ON LAND USE

Agriculture.	Very low capability. Steep topography, shallow soil depth and excessive stoniness are the main limitations to agriculture.
Forestry.	Moderate capability. Shallow soil depths, cool soils, and in some cases droughty conditions, limit tree growth.
Ungulates.	Low to moderate capability for moose and mule deer. Present use largely depends upon the successional stage of forest cover. Browse capability during the early seral stages, will vary widely from a dominance of low on the lithic soils, to inclusions of moderate and high on the deeper soils.
Recreation.	Low to moderate carrying capacity. Shallow soil depths and topography are the major limitations.
Engineering.	Severe to moderate limitations. Poor to fair suitability as subgrade materials due to a moderately high silt content, shallow soil depths in association with bedrock outcrops and escarpments, and adverse topography are limiting.

WENDT MOUNTAIN SOIL ASSOCIATION (WT)*

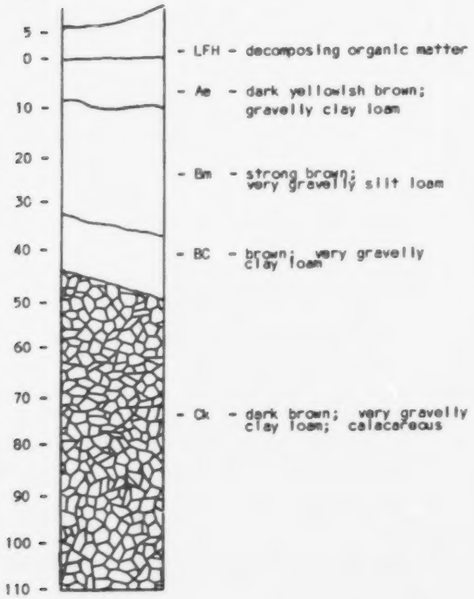
Wendt Mountain soils are located on the east flanks of the Rocky Mountains on slopes greater than 15% between the elevational limits of 1050 and 1850 m. They occur mainly on south and east facing slopes of the Kakwa River and Hanington Creek valleys. The soils have developed on gravelly sandy loam to gravelly clay loam colluvium which is usually more than 50 cm deep. The colluvium is usually calcareous below 50 cm depth and overlies dolomite, limestone, sandstone, or shale bedrock. The soils are subject to both a climatic rain shadow influence and calcareous parent material which retard podzolic development.

The soils are well drained, porous and have moderate moisture holding capacity. Variations in soil moisture status can be expected due to change in texture and the nature of seepage on lower mountain slopes.

The modal soil development is Degraded Eutric Brunisol (WT1 component). The WT3 component identifies inclusions of Podzolic and Dystric Brunisol soil development and is located at slightly higher elevations and/or on north aspects. This component is subject to more intense weathering, usually grades into Horseshoe or Hedrick soils which are mapped at even higher and wetter elevations. WT5 and WT6 components are mapped where Lithic Degraded Eutric Brunisols are respectively minor and major components of the map units.

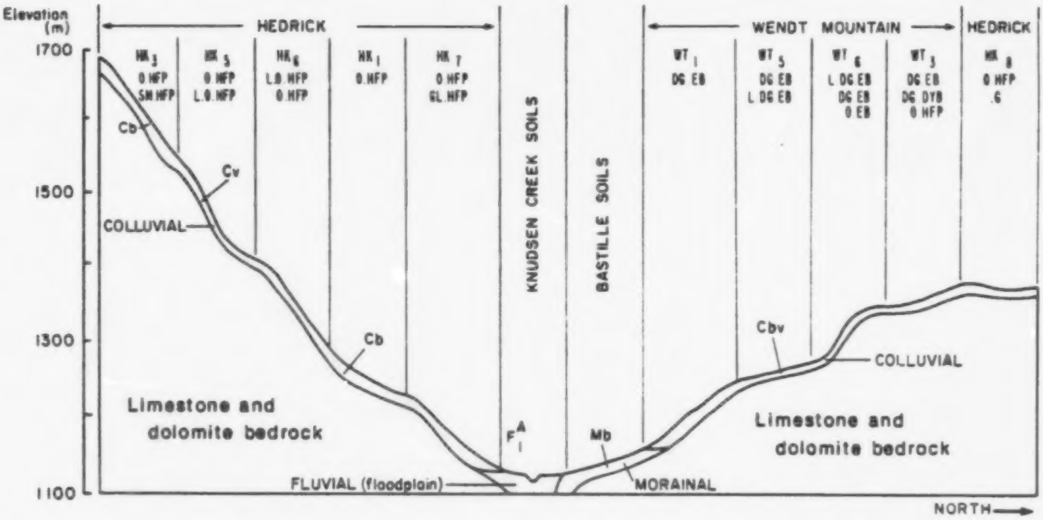
SOIL PROFILE

WT1; Degraded Eutric Brunisol


5
0
10
20
30
40
50
60
70
80
90
100
110
- LFH - decomposing organic matter
- Ae - dark yellowish brown; gravelly clay loam
- Bm - strong brown; very gravelly silt loam
- BC - brown; very gravelly clay loam
- Ck - dark brown; very gravelly clay loam; calacareous

Soil Association Component	Dominant Soil	Associated Soils	Soil Drainage Class	Depth to Bedrock (cm)
WT1	Degraded Eutric Brunisol		Well	>50
WT3	Degraded Eutric Brunisol		Well	>50
		Degraded Dystric Brunisol; Orthic Humo-Ferric Podzol	Well	>50
WT5	Degraded Eutric Brunisol		Well	>50
		Lithic Degraded Eutric Brunisol	Well	<50
WT6	Lithic Degraded Eutric Brunisol		Well	<50
		Degraded Eutric Brunisol; Orthic Eutric Brunisol	Well	>50

HEDRICK AND WENDT MOUNTAIN SOIL ASSOCIATIONS


Elevation (m)
1700
1500
1300
1100
HEDRICK
HK3 O.HFP SM.HFP
HK5 O.HFP L.O.HFP
HK6 L.O.HFP O.HFP
HK1 O.HFP
HK7 O.HFP GL.HFP
KNUDSEN CREEK SOILS
BASTILLE SOILS
WENDT MOUNTAIN
HEDRICK
WT1 DG EB
WT5 DG EB L DG EB
WT6 L DG EB DG EB O EB
WT3 DG EB DG DYB O HFP
HK8 O HFP .6
Cb
Cv
COLLUVIAL
Cb
Limestone and dolomite bedrock
F A I
Mb
FLUVIAL (floodplain)
MORAINAL
Cbv
COLLUVIAL
Limestone and dolomite bedrock
NORTH

Wendt Mountain soils occur in the Subalpine Engelmann spruce - subalpine fir zone of the Subboreal Region.

COMMENTS ON LAND USE

Agriculture. Extremely low capability. The adverse subalpine climate, excessive stoniness, and steep slopes impose severe limitations on agricultural use. Very limited natural grazing may be possible on some slopes.

Forestry. Low capability. A short growing season and inclusions of droughty, shallow soils impose limits on the forest capability.

Ungulates. Low capability for moose, goat, and caribou. Excessive winter snow depth and low forage quantity due to the mature stages of forest cover impose limits on ungulate use. Browse capability during the early seral stages would vary from moderate to low depending the soil depth and soil moisture regime.

Recreation. Moderate to very low carrying capacity. The rating depends primarily upon the slope steepness of a particular unit. Excessive stoniness and very shallow soils also impose limitations.

Engineering. Severe limitations. Steepness of slope, shallow to bedrock areas and frost action are the main limiting factors for engineering projects.

REFERENCES

Agriculture Canada. 1976. Glossary of Terms in Soil Science. Publ. 1469. Ottawa. 66 pp.

Asphalt Institute. 1963. Soils Manual for Design of Asphalt Pavement Structures. Manual Series No. 10 (MS-10), College Park, Maryland. pp. 269.

Atmosphere Environment Service. 1982a. Canadian Climate Normals, 1951-1980, Temperature and Precipitation, British Columbia. Environment Canada, Downsview, Ontario. 268 pp.

____________________ 1982b. Canadian Climate Normals, 1951-1980, Vol. 6, Frost. Environment Canada, Downsview, Ontario. 276 pp.

Bayrock, L. and T. Reimchen. (In preparation). Comprehensive Overview of Surficial Geology and Erosion Potential, Foothills of Alberta. Alberta Dept. of Environment, Edmonton, Alberta.

Block, J. and V. Hignett. 1976. Recreation Capability Inventory. British Columbia Resource Analysis Branch, Victoria, British Columbia. pp. 82.

Block, J. 1977. Outdoor Recreational Resources of the Northeast Coal Study Area 1976-1977. British Columbia Analysis Branch, Victoria, British Columbia.

Blower, D. 1973. Methodology: Land Capability for Ungulates in British Columbia. British Columbia Resource Analysis Branch, Victoria, British Columbia. pp. 24.

Brocke, L. K. 1970. Soil Survey for Recreation Planning in Two Alberta Provincial Parks. M. Sc. Thesis, Univ. of Alta., Edmonton, Alberta. pp. 111.

Campbell, R. B., W. B. Mountjoy and F. G. Young. 1973. Geology of McBride Map Area, British Columbia (93H). Paper 72-35. Geol. Survey of Canada. Ottawa, Ontario. pp.104.

Canada Dept. of Agriculture. 1974. The System of Soil Classification for Canada. Publ. 1455. Ottawa, Ontario. pp. 255. (Revised 1973 System used for taxonomy).

Canada Land Inventory. 1970. Objectives, Scope and Organization. Report No. 1. Canada Dept. of Reg'l. Econ. Expansion. Ottawa, Ontario. pp. 61.

Ceska, Adolf. 1979. Northeast Coal Study Area, 1977-1978: a List of Vascular Plant Species. British Columbia Ministry of Environment, Victoria, British Columbia. pp. 35.

Coen, G. M. and W. D. Holland. 1976. Soils of Waterton Lakes National Park, Alberta. Alta. Inst. Pedology S-73-44. Edmonton, Alberta. pp. 116.

Comeau, P and A. Comeau. (In preparation.) Vegetation Resources of the Northeast Coal Study Area 1977-78. British Columbia Ministry of Environment, Victoria, British Columbia.

REFERENCES (CONTINUED)

Craul, J. 1975. Physical Limitations of Soils. In: Logging Road and Skid Trail Construction, Proc of Workshop held Oct. 10-11, 1975. Ed. J. E. Fisher and D. W. Taber. AFRI Misc. Report No. 6. Syracuse, N. Y.

Dawson, A. B. (In preparation). Soils of the Prince George Area. Report No. 23 of the British Columbia Soil Survey, British Columbia Ministry of Environment, Victoria, British Columbia.

Demarchi, D. A. and A. P Harcombe. 1982. Forage Capability Classification For British Columbia: A Biophysical Approach. British Columbia Ministry of Environment, Parliament Buildings, Victoria, British Columbia.

E.L.U.C. Secretariat. 1976. Agriculture Land Capability in British Columbia. Prepared for British Columbia Dept. of Agriculture, Victoria, British Columbia. pp. 44.

E.L.U.C. Secretariat. 1976. The Terrain Classification System. Resource Analysis Unit. Victoria, British Columbia.

E.L.U.C. Secretariat. 1978. Environment and Land Use Sub-committee on Northeast Coal Development. Northeast coal study preliminary environmental report, 1977-1978. pp. 173, plus appendices.

E.L.U.S.C. 1977. Northeast Coal Study: Preliminary Environmental Report on Proposed Transportation Links and Townsites. Victoria, British Columbia. pp. 141, plus appendices.

Fredriksen, R. L. 1970. Erosion and Sedimentation following Road Construction and Timber Harvest on Unstable Soils in Three Small Western Oregon Watersheds. U.S.D.A. Forest Service Research, Paper PNW-104. Portland, Oregon. pp. 15.

Harcombe, A. P. 1978. Vegetation Resources of the Northeast Coal Study Area 1976-1977. British Columbia Ministry of Environment, Victoria, British Columbia.

Holland, S. H. 1964. Landforms of British Columbia: A Physiographic Outline. British Columbia Ministry of Mines and Petroleum Resources, Bulletin No. 48. Victoria, British Columbia. pp. 138.

Hortie, H. J., A. J. Green and T. M. Lord. 1970. Soils of the Upper Part of the Fraser Valley, Report No. 10 of the British Columbia Soil Survey. Canada Department of Agriculture, Ottawa.

Inventory and Engineering Branch. 1980. Snow Survey Measurements, Summary, 1935-1980. British Columbia Ministry of Environment, Victoria, British Columbia.

Irish, E. J. W. 1968. Structure of the Northern Foothills and Eastern Mountain Ranges, Alberta and British Columbia. Geologic Survey of Cananda, Bulletin No. 168. Ottawa, Ontario.

Kochenderfer, J. N. 1970. Erosion Control on Logging Roads in the Appalachians. U.S.D.A. Forest Service Research Paper NE-158. Upper Darby, P. A. pp. 28.

REFERENCES (CONTINUED)

Kowall, R. and J. Senyk. 1970. Land Capability for Forestry: Gwillim Lake (93P/SW). British Columbia Dept. of Agriculture, Kelowna, British Columbia. 1:125 000 scale map.

Kowall, R. 1971. Methodology: Land Capability for Forestry in British Columbia. British Columbia Dept. of Agriculture, Kelowna, British Columbia. pp 15.

Krajina, V. J. 1969. Ecology of Forest Trees in British Columbia. In Ecology of Western North America, Volume 2, No. 1. pp. 146.

Litton, R. G., Jr. 1968. Forest Landscapes Description and Inventories. U.S.D.A. Forest Service Research paper PSW-49. Berkeley, California. pp. 64.

Litton, R. G., Jr. 1974. Visual Vulnerability of Forest Landscapes. In Outdoor Recreation Research: Applying the Results, pp. 87-91. U.S.D.A. Forest Service Gen. Tech. Report NC-9. St. Paul, Minnesota.

Lord, T. M. 1982. Soils of the Quesnel Area, British Columbia. Soil Report No. 31 of the British Columbia Soil Survey. Land Resource Research Institute. Ottawa, Ontario.

Lord, T. M. and A, J. Green. (at press). Soils of the Barkerville Area. Soil Report No. 40 of the British Columbia Soil Survey. Land Resource Research Institute. Ottawa, Ontario.

Luckhurst, A. J., G. K. Young, J. W. van Barneveld and R. D. Marsh. 1973. Creston Wildlife Pilot Project: A Biophysical Habitat Approach to Capability Assessment and Management Potential of the Wildlife Resource. British Columbia Resource Analysis Branch (formerly British Columbia Land Inventory), Victoria, British Columbia. pp. 82.

Luckhurst, A. J. 1975. "Guidelines: Biophysical Land Capability Classification for Wildlife (Ungulates)". British Columbia Resource Analysis Branch, Victoria, British Columbia. pp. 15, plus appendices.

Maxwell, R. E. 1978. Soil and Terrain Maps 93H 9, 10, 14, 15, 16; 93I 1, 2, 7, 8 (1:50 000). Terrestrial Studies Section, British Columbia Ministry of Environment, Victoria, British Columbia.

McCormack, R. J. 1972. Land Capability Classification for Forestry. Canada Land Inventory Report No. 4. Ottawa, Ontario. pp. 72.

McKeague, J. A., editor. 1978. Manual on Soil Sampling and Methods of Analysis. 2nd Edition. Prepared by Subcommittee (of Canada Soil Survey Committee) on Methods of Analysis. Canadian Society of Soil Science. pp. 61-62.

Meidinger, D.V., G.D. Hope and A.J. McLoed. 1984. Classification and Interpretation of some Ecosystems of the Rocky Mountain Trench, Prince George Forest Region, British Columbia. Ministry of Forests, Victoria, British Columbia.

Montgomery, P. H. and R. C. Edminister. 1966. Use of Soil Surveys in Planning for Recreation. pp. 104-112. In Soil Surveys and Land Use Planning. Edited by L. J. Bartelli et al. Soil Science Soc. of Amer., Madison, Wisconsin.

REFERENCES (CONTINUED)

Moore, K. 1975. A Review of the Literature Pertaining to Blowdown. Unpubl. British Columbia Fish and Wildlife Branch Report. Victoria, British Columbia. pp. 19.

Moore, K. 1977. Factors Contributing to Blowdown in Streamside Leave Strips on Vancouver Island. Land Mgt. Series No. 3. British Columbia Ministry of Forests. Victoria, British Columbia.

Pearse, P. 1976. Timber Rights and Forest Policy in British Columbia. Volume I. Report of the Royal Commission on Forest Resources. British Columbia Ministry of Forests. Victoria, British Columbia. pp. 395.

Perret, N. G. 1970. Land Capability Classification for Wildlife. Canada Land Inventory Report No. 7, Ottawa, Ontario. pp. 30.

Reimchen, T. 1977. Bedrock Lithology of Northeast Coal Area (1:250 000) scale map). Prepared for Resource Analysis Branch, Victoria, British Columbia.

Reimchen, T., J. D. Miller, I. D. Thomson and G. B. Ishi. 1977. Terrain Analyses and Erosion Potential of Northeast Coal Block Study Area. Prepared for E.L.U.C. Secretariat. Victoria, British Columbia. pp. 32.

Rutter, N. W. 1968. A Method for Predicting Soil Erosion in the Rocky Mountain Forest Reserve, Alberta. Geol. Survey of Canada, Paper 67-67. Ottawa, Ontario. pp. 32.

Snyder, R. V. and J. M. Wade. 1970. Mt. Baker National Forest: Soil Resource Inventory. Seattle, Washington. pp. 267.

Stott, D. F. 1960. Cretaceous rocks between Smoky and Pine Rivers, Rocky Mountain Foothills, Alberta and British Columbia Geol. Survey of Can. Paper 60-16. Ottawa, Ontario.

Stott, D. F. 1961. Dawson Creek Map Area, British Columbia Geol. Survey of Can. Paper 61-10. Ottawa, Ontario.

Stott, D. F. 1967. The Cretaceous Smoky Group, Rocky Mountain Foothills, Alberta and British Columbia Geol. Survey of Can. Bulletin 132, Ottawa, Ontario. pp. 133, plus maps.

Swanston, D. N. 1971. Principal Mass Movements Influenced by Logging, Road Building and Fire. In A Symposium - Forest Land Uses and Stream Environment, October 19-21, 1970. Oregon State Univ., Corvallis, Oregon.

Tetlow, R. and S. Sheppard. 1977. Visual Resources of the Northeast Coal Study Area 1976-1977. British Columbia Resource Analysis Branch, Victoria, British Columbia.

U.S.D.A. Forest Service. 1973. National Forest Landscape Management, Volume 1, Agric. Handbook No. 434, Washington, D. C. pp. 76.

REFERENCES (CONTINUED)

U.S.D.A. Forest Service. 1974. National Forest Landscape Management, Volume 2: Chapter 1 - The Visual Management System. Agric. Handbook No. 462. Washington, D. C. pp. 47.

U.S.D.A. Soil Conservation Service. 1971. Guide for Interpreting Engineering Uses of Soils. Washington, D. C. pp. 87.

U.S.D.I. Bureau of Land Management. (no date). Forest Engineering Handbook. Portland, Oregon. pp. 220.

van Barneveld, J. 1976. Vegetation; Inventory, Methodology and Interpretation. In Natural Resource Inventory, U. B. C. Centre for Continuing Education, Vancouver, British Columbia. pp. 83-112.

Vold, T. 1977. Biophysical Soil Resources and Land Evaluation of the Northeast Coal Study Area: 1976-1977. Volume One. Resource Analysis Branch, British Columbia Ministry of Environment, Victoria, British Columbia.

Vold, T. 1975. A Resource and Visitor Inventory of Yoho Valley, Yoho National Park, British Columbia M. F. Thesis, Univ. of British Columbia, Vancouver, British Columbia. pp. 177.

Vold, T., R. Maxwell and R. Hardy. 1977. Biophysical Soil Resource and Land Evaluation of the Northeast Coal Study Area 1976-1977. Volume Two. Resource Analysis Branch, British Columbia Ministry of Environment, Victoria, British Columbia.

GLOSSARY

AASHO, classification, soil engineering - The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway Officials.

acid soil - A soil material having a pH of less than 7.0.

aggregate - Sand, gravel and other similar mineral material suitable for use in construction (i.e. for road surfaces, concrete, pavement).

aggregate, soil - A group of soil particles cohering, in such a way that they behave mechanically as a unit.

alluvium - A general term for all deposits of rivers and streams.

anthropogenic - Man-made, or strongly man-modified, soil materials.

aspect - A measure of orientation of a slope by means of compass points.

association, soil - A sequence of soils of about the same age, derived from similar parent materials, and occuring under similar climatic conditions but having different characertistics due to variation in relief and in drainage.

Atterberg Limits (Plastic Limits) - The range of water content over which a soil exhibits plastic behaviour. The Lower Atterberg Limit is the water content at which the soil is not plastic when worked and crumbles on application of pressure. The Upper Atterberg Limit is the water content at which the soil changes from plastic to flow behaviour.

available nutrient - The portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

available soil water - The portion of water in a soil that can be readily absorbed by plant roots; generally considered to be the water held in the soil up to approximately 15 atmospheres tension.

base saturation - The extent to which the adsorption complex of a soil is saturated with exchangeable cations other than hydrogen and aluminum. It is expressed as a percentage of the total cation exchange capacity.

beach deposits - Sediments that are modified in their degree of sorting, or surface relief, or both, by the action of waves in forming beaches.

bearing capacity - The average load per unit area that is required to rupture a supporting soil mass.

bedrock - The solid rock that underlies soil and the regolith, or that is exposed at the surface.

blanket - A mantle of unconsolidated material thick enough to mask minor irregularities in the underlying rock or other deposits, but which still conforms to the general underlying topography.

bog - An area covered, or filled with, peat material which generally consists of undecomposed to moderately decomposed mosses.

boulders - Rock fragments over 60 cm (2 ft) in diameter. In engineering practice boulders are greater than 20 cm (8 inches) in diameter.

bulk density, soil - The mass of dry soil per unit bulk volume is determined before the soil is dried to constant weight at 105°C.

capability class, soil - A rating that indicates the general capability of a soil for some use such as agriculture, forestry, recreation, or wildlife. It is a grouping of subclasses that have the same relative degree of limitation or hazard. The limitation or hazard becomes progressively greater from Class 1 to Class 7.

capability subclass, soil - A grouping of soils that have similar kinds of limitations and hazards. It provides information on the kind of management difficulty, conservation problem or limitation. The class and subclass together provide information about the degree and kind of limitation for land-use planning, and for the assessment of conservation needs.

carbon-nitrogen ratio (C/N ratio) - The ratio of the weight of organic carbon to the weight of total nitrogen in a soil or in an organic material.

category - A grouping of related soils defined at approximately the same level of abstraction. In the Canadian soil classification the categories are order, great group, subgroup, family, and series.

cation exchange - The interchange of a cation in solution and another cation on the surface of any surface-active material such as clay colloid or organic colloid.

cation exchange capacity (CEC) - A measure of the total amount of exchangeable cations that can be held by a soil. It is expressed in milliequivalents per 100 g of soil.

cemented-indurated - Having a hard, brittle consistence because the particles are held together by cementing substances such as humus, calcium carbonate, or the oxides of silicon, iron, and aluminum. The hardness and brittleness persist even when the soil is wet.

channelled (ridge and swale) - Characteristic ridge and swale topography (0-10% slopes common). Often a pattern or series of closely spaced curvilinear ridges and swales. A poorly integrated drainage pattern may be evident.

chroma - The relative purity, strength, or saturation of a colour. It is directly related to the dominance of the determining wavelength of light. It is one of the three variables of colour. See also **Munsell colour system; hue;** and **value, colour.**

classification, soil - The systematic arrangement of soils into categories on the basis of their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

clay - (i) As a soil particle term: a size fraction less than 0.002 mm in equivalent diameter, or some other limit (geologist and engineers). (ii) As a rock term: a natural, earthy, fine grained material that developes plasticity with a small amount of water. (iii) As a soil term: a textural class in which the soil materials contain 40 percent or more of clay. (iv) As a soil separate: a material usually consisting largely of clay material but commonly also of amorphous free oxides and primary minerals.

clay loam - Soil material that contains 27% to 40% clay and 20% to 45% sand.

clayey - Containing large amounts of clay, or having properties similar to those of clay.

climax - A plant community of the most advanced type capable of development under, and in dynamic equilibrium with, the prevailing environment.

coarse fragments - Rock or mineral particles greater than 2.0 mm in diameter.

coarse texture - The texture exhibited by sands, loamy sand, and sandy loams except very fine sandy loam. A soil containing large quantities of these textural classes.

cobble - Rounded or partially rounded rock or mineral fragment 7.5 to 25 cm (3 to 10 inches) in diameter. In engineering practice, cobbles are greater than 7.5 cm (3 inches) but less than 20 cm (8 inches) in diameter.

colluvium - Loose material accumulated on and at the foot of slopes by the various processes of mass movement (gravity). Highly variable textures depending on source material (often boulder-sized material). Unsorted to crudely stratified.

colour, soil - Soil colours are compared with a Munsell colour chart. The Munsell system specifies the relative degrees of the three simple variables of colour; hue, value and chroma. For example: 10YR 6/4 means a hue 10YR, a value of 6, and a chroma of 4. See also **Munsell colour system; hue;** and **value, colour.**

complex, soil - A mapping unit used in detailed and reconnaissance soil surveys where two or more defined soil units are so intimately intermixed geographically that it is impractical, because of the scale used, to separate them.

compaction soil - The packing together of soil particles by forces exerted at the soil surface resulting in increased soil density.

consistence - (i) The resistance of a material to deformation or rupture.
(ii) The degree of cohesion or adhesion of the soil mass. Terms used for describing consistence at various soil mositure contents are:
wet soil - nonsticky, slightly sticky, sticky, and very sticky; nonplastic, slightly plastic, plastic, and very plastic.

moist soil - loose, very friable, friable, firm, and very firm; compact, very compact, and extremely compact.
dry soil - loose, soft, slightly hard, hard, very hard, and extremely hard.
cementation - weakly cemented, strongly cemented, and indurated.

creep, soil - The slow, continuous downslope movement of mantle materials as the result of long-term application of gravitational stress. It occurs in varying degrees in association with most other types of soil mass movements but dominates as a major process in itself on slopes covered with deep, cohesive soils.

delta - A fluvial or glaciofluvial deposit which is a relatively level usually triangular shaped form occurring at the mouth of a stream as it enters a lake or ocean. May have numerous presently occupied or abandoned channels which appear as an integrated drainage pattern.

deposit - Material left in a new position by a natural transporting agent such as water, wind, ice, or gravity, or by the activity of man.

drainage, soil - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil to underground spaces. (2) As a condition of the soil, it refers to the frequency and duration of periods when the soil is free of saturation.

dunes - Wind-built ridges and hills of sand.

eluviation - The transportation of soil material in suspension or in solution within the soil by the downward or lateral movement of water.

eolian deposit - Sand, or silt, or both, deposited by the wind, See also loess and dunes.

erosion - The group of processes whereby surficial or rock materials are loosened, or dissolved and removed from any part of the earth's surface. It includes the processes of weathering, solution, corrosion and transportation.

fan - Fluvial deposits which are level to steeply sloping (0-50%) fan-like form occurring where a stream runs out onto a level plain or meets a slower stream. Fans are often marked by variegated current scars, abandoned and presently occupied channels. Noticeable slope towards the fan toe or apron.

fen - An area covered by peat material which generally consists of well to moderately decomposed sedge and reed vegetation.

fertility, soil - The status of a soil with respect to the amount and availability of elements necessary for plant growth.

fibric layer - A layer of organic soil material containing large amounts of weakly decomposed fiber whose botanical origin is readily identifiable.

field capacity - The percentage of water remaining in the soil 2 or 3 days after the soil has been saturated and free drainage has practically ceased. The percentage may be expressed in terms of weight or volume.

fine texture - Consisting of or containing large quantities of the fine fractions, particularly of silt and clay. It includes all the textural classes of clay loams and clays: clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay, and clay. Sometimes it is subdivided into clayey texture and moderately fine texture.

floodplain - The land bordering a stream or river built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

fluvial, deposits - Materials laid down by recent streams and rivers. Variable textures (few boulders or coarse fragments). Moderately well to well sorted and moderately well to well stratified.

fluvioglacial, deposits - Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers, and kame terraces.

friable - Soil aggregates that are soft and easily crushed between thumb and forefinger.

genesis, soil - The mode of origin of the soil, especially the processes or soil-forming factors responsible for the development of the solum from unconsolidated parent material.

geomorphology - The study of landforms as they relate to geologic composition and history.

glacial till (ablation) - Materials deposited directly by ice with some modification and transportation by glacial meltwater. Variable textures (often stony and bouldery). Poorly sorted and partially stratified.

glacial till (basal) - Materials deposited by ice directly without intervening transportation by water. Variable textures (most often heterogeneous mixture of sands, silts and clays - some often stony and bouldery). Unsorted and unstratified.

gleyed soil - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both in some horizons than the associated well-drained soils.

Gleysolic - An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas, or prominent mottling, or both, in some horizons.

gravel - Rock fragments 2 mm to 7.5 cm in diameter.

gravelly - Containing appreciable or significant amounts of gravel. The term is used to describe soils or lands.

great group - A category in the Canadian system of soil classification. It is a taxonomic group of soils having certain morphological features in common and a similar pedogenic environment.

groundwater - Water that is passing through or standing in the soil and the underlying strata. It is free to move by gravity.

horizon, soil - A layer of soil or soil material approximately parallel to the land surface, it differs from adjacent genetically related layers in properties such as colour, structure, texture, consistence, and chemical, biological and mineralogical composition. A list of the designations and properties of soil horizons may be found in the Canadian System of Soil Classification, 1978.

organic horizons - May be found at the surface of mineral soils or at any depth beneath the surface in buried soils or overlying geologic deposits. They contain more than 30% organic matter. Two groups of these layers are recognized:

O - An organic layer or layers developed under poorly drained conditions, or under conditions of being saturated most of the year or on wet soils that have been artificially drained.

Of - Fibric layer. An orgnic layer which is the least decomposed of all the organic soil materials. It has large amounts of well-preserved fiber that is readily identifiable as to botanical origin.

Om - Mesic layer. An organic layer which is intermediate in decomposition between the less decomposed fibric and the more decomposed humic materials. This material has intermediate values for fiber content, bulk density and water content. The material is partly altered both physically and biochemically.

Oh - Humic layer. An organic layer which is the most decomposed of all the organic soil materials. It has least amount of plant fiber, the highest bulk density values and the lowest saturated water content. This material is relatively stable having undergone considerable change from the fibric state primarily because of oxidation and humification.

L, F, and H - These are organic horizons that developed primarily from the accumulation of leaves, twigs, and woody materials with or without a minor component of mosses. Usually they are not saturated with water for prolonged periods.

L - An organic layer characterized by the accumulation of partly decomposed organic matter.

F - An organic layer characterized by the accumulation of partly decomposed organic matter. The original structures are discernible with difficulty. Fungi mycelia are often present.

H - An organic layer characterized by an accumulation of decomposed matter in which the original structures are indiscernible.

master mineral horizons and layers - Mineral horizons are those that contain less than 30 percent organic matter.

A - A mineral horizon formed at or near the surface in the zone of removal of materials in solution and suspension and/or maximum accumulation of organic matter. Included are: (1) horizons in which organic matter has accumulted as a result of biologic activity (Ah); (2) horizons that have been eluviated of clay, iron, aluminum, and/or organic matter (Ae); (3) horizons having characteristics of (1) and (2) above but transitional to underlying B or C (AB or A and B); (4) horizons markedly disturbed by cultivation or pasture (Ap).

B - A mineral horizon or horizons characterized by one or more of the following: An enrichment in silicate clay, iron, aluminum or humus, alone or in combination (Bt, Bf, Bhf and Bh); Significant accumuations of exchangeable sodium (Bn), relative uniform browing due to oxidation of iron (Bm), and mottling and gleying of structurally altered material associated with periodic reduction (Bg).

C - A mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (1) the process of gleying, and (2) the accumulation of calcium and magnesium carbonates and more soluble salts (Cca, Csa, Cg and C).

R - Underlying unconsolidated bedrock, such as granite, sandstone, limestone, etc. The boundary between the R layer and any overlying unconsolidated material is called a lithic contact.

lower case suffixes

b - Buried soil horizon.

c - A cemented (irreversible) pedogenic horizon.

ca - A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material. It is more than four inches thick and if it has a $CaCO_3$ equivalent of less than 15%, it should have at least 5% $CaCO_3$ equivalent than the parent material. If it has more than 15% $CaCO_3$ equivalent, it should have 1/3 more $CaCO_3$ equivalent than IC.

cc - Cemented (irreversible) pedogenic concretions.

e - A horizon enriched with hydrated iron. It usually has a chroma of 3 or more. It is higher in colour value by one or more units when dry than an underlying B horizon.

f - A horizon enriched with amorphous material, principally Al and Fe combined with organic matter. It usually has a hue of 7.5**YR** near the upper boundary and becomes yellower with depth. When moist the chroma is higher than 3 or the value is 3 or less. It contains at least 0.6% pyrophosphate-extractable Al + Fe in textures finer than sand and 0.4% in sands (coarse sand, sand, fine sand, and very fine sand). The ratio of pyrophosphate-extractable Al +Fe to clay (<0.002 mm) is more than 0.005 and organic C exceeds 0.5%. Pyrophosphate-extractable Fe is at least 0.3%, or the ratio of organic C to pyrophosphate-extractable Fe is less than 20, or both are true. It is used with B alone (Bf), with B and h (Bhf), with B and g (Bfg), and with other suffixes. These criteria do not apply to Bgf horizons, The following f horizons are differentiated on the basis of the organic C content:

Bf - 0.5-5% organic C
Bhf - more than 5% organic C

No minimum thickness is specified for a Bf or a Bhf horizon, Thin Bf and Bhf horizons do not qualify as podzolic B horizons as defined later in this chapter.
Some Ah and Ap horizons contain sufficient pyrophosphate-extractable Al + Fe to satisfy this criterion of f but are designated Ah or Ap.

g - A horizon characterized by gray colours and/or prominent mottling indicative of permanent or periodic intense reduction. Chromas of the matrix are generally one or less.

h - A horizon enriched with organic matter. When used with A alone, (Ah) it refers to the accumulation of organic matter and must contain less than 30% organic matter. It must show one Munsell unit of value darker than the horizon immediately below or have one percent more organic matter than the IC. When used with A and e it refers to an Ah horizon which has been degraded as evidenced, under natural conditions, by streaks and plotches and often by platy structure.

j - Used as a modifier of e, g, n and t to denote an expression of, but failure to meet the specified limits to the suffix it modifies.

k - Presence of carbonate as indicated by visible effervescence with dilute HCL.

m - A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in colour or structure, or both. It has:

1) Soil structure rather than rock structure comprising more than half the volume of all subhorizons.

2) Some weatherable minerals.

3) Evidence of alteration in one of the following forms:

a) Stronger chromas and redder hues than the underlying horizons.

b) Evidence of the removal of carbonates.

4) Illuviation, if evident, is too slight to meet the requirements of a textural B or a podzolic B.

5) No cementation or induration and lacks a brittle consistence when moist.

p - A layer disturbed by man's activities, i.e. by cultivation and/or pasturing. To be used only with A.

s - A horizon with salts including gypsum which may be detected as crystals or veins, or as surface crusts of salt crystals, or by stressed crop growth, or by the presence of salt tolerant plants.

sa - A horizon with secondary enrichment of salts more soluble than calcium and magnesium carbonates; the concentration of salts exceeds that present in the unenriched parent material. The horizon is 10 cm or more thick. The conductivity of the saturation extract must be at least 4 mmhos/cm and must exceed that of the C horizon by at least one-third.

t - A horizon enriched with silicate clay. It is used with B alone (Bt, Btg, etc.).

horizon boundary - Horizon boundaries are indicated by distinctness and form. The distinctness of a horizon boundary depends partly on the degree of contrast with the adjacent lower horizon and partly on the thickness of any transition zone between them.

hue - The aspect of colour that is determined by the wavelengths of light, and changes with the wavelength. Munsell hue notations indicate the visual relationship of a colour to red, yellow, green, blue, or purple, or an intermediate of these hues. See also **Munsell colour system, chroma,** and **value, colour.**

humus - That more or less stable fraction of the soil organic matter remaining after most of the added plant and animal residues have decomposed.

humus form - A group of soil horizons located at or near the surface of a pedon, which have formed from organic residues, either separate from, or intermixed with mineral materials. See also mull; moder; and mor.

ice contact - Fluvioglacial deposits laid down along the margins of glaciers.

igneous rock - Rock formed by the cooling and solidification of magma. It has not been changed appreciably since its formation.

illuvial horizon - A soil horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension.

illuviation - The process of depositing soil material removed from one horizon in the soil to another, usually from an upper to a lower horizon in the soil profile. Illuviated substances include silicate clay, hydrous oxides of iron and aluminum, and organic matter.

impeded drainage - A condition that hinders the movement of water by gravity through soils.

impervious - Resistant to penetration by fluids or roots.

inclusion - Soil types found within a mapping unit which are not extensive enough to be mapped separately or as part of a soil complex.

infiltration - The downward entry of water into the soil.

infiltration rate - A soil characteristic determining or describing the maximum rate at which water can enter the soil under specified conditions, including the presence of excess water.

inorganic soil - A soil made up mainly of mineral particles; a soil containing less than 17% organic carbon.

kame - An irregular ridge or hill of stratified glacial drift deposited by glacial meltwater.

kettle - Depression left after the melting of a mass of glacier ice buried in drift.

lacustrine deposits - Sediments that have settled from suspension in bodies of standing fresh water and are later exposed by lowering the water level or by up-lifting of the land.

land - The solid part of the earth's surface or any part thereof. A tract of land is defined geographically as a specific area of the earth's surface. Its characteristics embrace all reasonably stable, or predictably cyclic, attributes of the biosphere vertically above and below this area, including those of the atmosphere, the soil, and the underlying geology, the hydrology, the plant and animal populations, and the results of past and present human activity, to the extent that these attributes exert a significant influence on the present and future use of land by man.

land classification - The arrangement of land units into various categories based on the properties of the land or its suitability for some particular purpose.

landforms - The various shapes of the land surface resulting from a variety of actions such as deposition or sedimentation (eskers, lacustrine basins), erosion (gullies, canyons), and earth crust movements (mountains).

landscape - All features such as fields, hills, forests, and water that distinguish one part of the earth's surface from another part. Usually it is the portion of land or territory that the eye can see in a single view, including all its natural characteristics.

leaching - The removal from the soil of materials in solution.

levee - A natural or artificial embankment along a river or stream.

lithic layer - Bedrock under the control section of a soil. In Organic soils, bedrock occurring within a depth of between 10 cm and 160 cm from the surface, while in mineral soils it occurs between 10 and 100 cm of the surface.

loamy - Intermediate in texture and properties between fine-textured and coarse-textured soils. It includes all textural classes having "loam" or "loamy" as a part of the class name, such as clay loam or loamy sand.

loess - Material transported and deposited by wind and consisting of predominantly silt sized particles.

Luvisolic - An order of soils that have eluvial (Ae) horizons, and illuvial (Bt) horizons in which silicate clay is the main accumulation product. The soils developed under forest or forest-grassland transition in a moderate to cool climate.

map, soil - A map showing the distribution of soil mapping units related to the prominent physical and cultural features of the earth's surface.

mapping unit, soil - Any delineated area shown on a soil map that is identified by a letter, symbol or number. A mapping unit may be a soil unit, a miscellaneous land type, or a complex of soil units.

medium texture - Intermediate between fine-textured and coarse-textured soils. It includes the following textural classes: very fine sandy loam, loam, silt loam, and silt.

meltwater channel - An incised flat bottomed channel often appearing over-sized for the present stream which occupies it - sidewalls (10-60% slopes); channel bottom (0-10%).

mesic layer - A layer of organic material at a stage of decomposition between that of the fibric and humic layers.

metamorphic rock - Rock derived from pre-existing rocks, but differing from them in physical, chemical, and mineralogical properties as a result of natural geological processes, principally heat and pressure, originating within the earth. The pre-existing rocks may have been igneous, sedimentary, or another form of metamorphic rock.

mineral soils - A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. It contains less than 17% organic carbon except that an organic surface layer if present may be up to 40 cm thick.

miscellaneous land type - A mapping unit for areas of land that have little or no natural soil.

moderately coarse texture - Consisting predominantly of coarse particles. In soil textural classification, it includes all the sandy loams exept very fine sandy loam.

moderately fine texture - Consisting predominantly of intermediate-sized soil particles with or without small amounts of fine or coarse particles. In soil textural classification, it includes clay loam, sandy clay loam, and silty clay loam.

moraine (glacial till) - The materials transported beneath, beside, on, within and in front of a glacier; deposited directly from the glacier and usually not modified by any intermediate agent.

morphology, soil - (i) The physical constitution, particularly the structural properties, of a soil profile and exhibited by the kinds, thickness, and arrangement of the horizons in the profile, and by the texture, structure, consistence, and porosity of each horizon. (ii) The structural characteristics of the soil or any of its parts.

mottles - Spots or streaks, apparent in soil matrix. Colours are usually yellow, red, or orange. They are described in terms of abundance (few, common, many), size (fine, medium, coarse) and contrast (faint, distinct, prominent). Mottling in soils indicates poor aeration and lack of good drainage.

mottling - Formation of presence of mottles in the soil.

Munsell colour system - A colour designation system specifying the relative degrees of the three simple variables of colour: hue, value, and chroma.

Order, soil - The highest category in the Canadian system of soil classification. All the soils of Canada have been divided into nine orders: Chernozemic, Solonetzic, Luvisolic, Podzolic, Brunisolic, Regosolic, Gleysolic, Organic, and Cryosolic. All the soils within an order have one or more characteristics in common.

Organic - An order of soils that have developed dominantly from organic deposits. The majority of Organic soils are saturated for most of the year, unless artificially drained, but some of them are not usually saturated for more than a few days. They contain 17% or more organic carbon.

organic matter, soil - The organic fraction of the soil; including plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population.

ortstein - (I) An indurated layer in the B horizon of Podzols in which the cementing material consists of illuviated sesquioxides and organic matter. (II) As a subgroup of Podzolic soils, Ortstein indicates a Bhfc or Bfc horizon that is strongly cemented, occurs over at least one-third of the exposure, and is at least 2.5 cm thick.

outwash, glacial - Sediments washed out by flowing water beyond a glacier and laid down in thin foreset beds as stratified drift. Particle size may range from boulders to silt.

pans - Horizons or layers in soils that are strongly compacted, indurated, or very high in clay content.

parent material - The unaltered or essentially unaltered mineral or organic material from which the soil profile develops by pedogenic processes.

peat - Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter.

ped - A unit of soil strucure such as a prism, block, or granule, which is formed by natural processes, in contrast with a clod, which is formed artificially.

pedogenic - Of or referring to the genesis (formation and development) of soil; used mainly when discussing the kind, strength and distribution of soil horizons in a soil profile.

pedology - Those aspects of soil science dealing with the origin, morphology, genesis, distribution, mapping, and taxonomy of soils, and classification in terms of their use.

perched water table - A water table due to the "perching" of water on a relatively impermeable layer at some depth within the soil. The soil within or below the impermeable layer is not saturated with water.

percolation (of soil water) - The downward movement of water through soil.

permeability, soil - The ease with which gases and liquids penetrate or pass through a bulk mass of soil or a layer of soil. Because different soil horizons vary in permeability, the specific horizon should be designated.

perviousness - The potential of a soil to transmit water internally, as inferred from soil characteristics.

pH, soil - The intensity of acidity or alkalinity, expressed as the logarithm of the reciprocal of the H+ ion concentration. pH 7 is neutral, lower values indicate acidity and higher values alkalinity.

plain - A flat to gently undulating surface form (0-10% slopes). Slopes are most often simple and have variable drainage pattern depending on texture of material.

platy - Consisting of soil aggregates that have developed predominantly along the horizontal axes; laminated; flaky.

Podzolic - An order of soils having podzolic B horizons (Bh, Bhf, or Bf) in which amorphous combinations of organic matter (dominantly fulvic acid), Al, and usually Fe are accumulated. The sola are acid and the B horizons have a high pH-dependent charge. The great groups in the order are Humic Podzol, Ferro-Humic Podzol, and Humo-Ferric Podzol.

profile, soil - A verticle section of the soil through all its horizons and extending into the parent material.

puddled soil - A soil in which the structure has been mechanically destroyed, which allows the soil to run together when saturated with water. A soil which has been puddled occurs in a massive nonstructural state.

reaction, soil - The degree of acidity or alkalinity of a soil, which is usually expressed as a pH value.

Regosolic - An order of soils having no horizon development or development of the A and B horizons insufficient to meet the requirements of the other soil orders.

relief - The difference in elevations or irregularities of the land surface when considered collectively.

runoff - The portion of the total precipitation on an area that flows away through stream channels. Surface runoff does not enter the soil. Groundwater runoff or seepage flow from groundwater enters the soil before reaching the stream.

saline - A nonalkali soil that contains enough soluble salts to interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 mS/cm, the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

sand - a soil particle between 0.05 and 2.0 mm in diameter. The textural class name for any soil containing 87% or more of sand and not more than 10% of clay.

scarp - A steep, precipitous slope of some extent along the margin of a plateau, mesa, terrace, or bench.

sedimentary rock - A rock formed from materials deposited from suspension or precipitated from solution and usually more or less consolidated. The principal sedimentary rocks are sandstones, shales, limestones, and conglomerates.

seepage - (i) The escape of water downward through the soil. (ii) The emergence of water from the soil along an extensive line of surface in contrast to a spring where the water emerges from a local spot.

series, soil - The second category in the Canadian system of soil classification. This is the basic unit of soil classification, consisting of soils which are essentially alike in all major profile characteristics except the texture of the surface.

silt - Soil mineral particles ranging between 0.05 and 0.002 mm in equivalent diameter. Soils of the silt textural class contain 80% silt and less than 12% clay.

site - In ecology, an area described or defined by its biotic, climatic and soil conditions as related to its capacity to produce vegetation. An area sufficiently uniform in biotic, climatic, and soil conditions to produce a particular kind of vegetation.

slump - A deep-seated, slow moving rotational failure occurring in plastic materials resulting in vertical and lateral displacement.

soil - The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effect), macro and micro organisms, and topography, all acting over a period of time.

soil forming factors - The variable, usually interrelated natural agencies that are responsible for the formation of soil. The factors are: parent material, climate, organisms, relief, and time.

soil texture - The relative proportions of the various soil separates in a soil as described by the classes of soil texture. The names of textural soil classes may be modified by adding suitable adjectives when coarse fragments are present in substantial amounts.

solum - The upper horizons of a soil in which the parent material has been modified and within which most plant roots are confined. It consists usually of A and B horizons.

stones - Rock fragments 25 cm in diameter if rounded, and 38 cm along the greater axis if flat.

stratified materials - Unconsolidated gravels, sand, silt and clay arranged in strata or layers.

structure, soil - The combination or arrangement of primary soil particles into secondary particles, units, or peds. The peds are characterized and classified on the basis of size, shape, and degrees of distinctness into classes, types and grades.

subgroup, soil - A category in the Canadian system of soil classification. These are subdivisions of the soil great groups.

subsoil - A general term for the layer of soil (or surficial geologic deposit) which, in the context of this report, underlies the surface and subsurface soil layers. It begins about 50 cm below the surface and continues downward for about 75 to 100 cm.

subsurface soil - A general term used in this report for the approximately 20 to 30 cm thick layer of soil underlying the surface soil.

surface soil - The uppermost part of the soil that is ordinarily moved in tillage, or its equivalent in uncultivated soils. In this report it refers to the upper 15 to 20 cm of the soil.

talus - Very steeply sloping (50% + slopes) roughly cone shaped form at the foot of a steep slope or rock cliff. No drainage pattern.

terrace - Relatively level (0-5% slopes) flat surface which is terminated by an abrupt change in slopes on one or more sides. Often occurs in sequence on valley walls or paired on opposite sides of a valley.

terric layer - An unconsolidated mineral substratum underlying organic soil material.

till - See glacial till.

topography - The shape of the ground surface such as hills, mountains or plains. The soil slopes may be smooth or irregular. The slope classes are defined in Chapter 3.1.3.

Unified soil classification system (engineering) - A classification system based on the identification of soils according to their particle size, gradation, plasticity index and liquid limit. It is employed in schemes to predict soil behavior as an engineering construction material.

value, colour - The relative lightness of colour, which is approximately a function of the square root of the total amount of light.

variant, soil - A soil whose properties are believed to be sufficiently different from other known soils to justify a new name, but comprising such a limited geographic area that creation of a new named soil is not justified.

varve - A distinct band representing the annual deposit in sedimentary materials regardless of origin and usually consisting of two layers, one thick light coloured layer of silt and fine sand laid down in spring and summer, and the other a thin, dark coloured layer of clay laid down in the fall and winter.

water holding capacity - The ability of a soil to hold water. The water-holding capacity of sandy soils is usually considered to be low, while that of clayey soils is high.

water table - Elevation at which the pressure in the water is zero with respect to atmospheric pressure.

weathering - The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

APPENDIX A

SOIL LEGEND FOR THE JARVIS CREEK-MORKILL RIVER SURVEY AREA

APPENDIX A

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION (IWB): INTERIOR WESTERN HEMLOCK - WESTERN RED CEDAR ZONE (IwH-wC)
: INTERIOR WESTERN RED CEDAR - WHITE SPRUCE ZONE(IwC-wS)

SURFICIAL [illegible]	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal	Lanezi	LZ1	P.GL		Mbv	sc-l	15-30	MWD-WD	>50	5-30	731-1440	Rocky Mountain Trench	Occurs dominantly in the (IwH-wC).
		LZ2	P.GL	BR.GL	Mbv	sc-l	15-30	WD-MWD	>50	10-40	800-1440		Generally on south and west facing slopes; climatically drier.
		LZ4	P.GL	LU.FHP O.HFP	Mbv	sl-l l-sc	15-30	WD-MWD	>50	5-20	731-915		Coarse surface horizons, ie. beach strands or washed areas.
		LZ5	P.GL	L.P.GL L.O.HFP	Mbv	sc-l	15-30	WD-MWD	>50	5-40	731-1440		
		LZ7	P.GL	GL.P.GL	Mbv	sc-l	15-30	MWD-ID	>50	5-30	731-1440		Often quite extensive; includes seepage sites in hollows, at the base of slopes.
		LZ8	P.GL	.G	Mbv	sc-l	15-30	MWD-PD	>50	5-20	731-1440		Includes peaty phases of 40 to 60 cm in depth.
Organic	Catfish Creek	CC1	TY.M	F.M	O^{B}bl	m	-	VPD	>160	0-2	731-1440		CC soils occurs dominantly in the (IwC-wS). CC1, deep organic, depths generally >160 cm.
		CC4	TY.M	TY.F	O^{B}bl	m-f	-	VPD	>160	0-2	731-1440		Deeper fibric peat horizons, usually has a higher water table and a more active drainage.
		CC5	TY.M	T.M	O^{B}bl	m	-	VPD	>100	0-2	731-1440		Mineral soil contact within 60-160 cm from the surface.
		CC6	T.M	TY.M L.M	O^{B}bl	m	-	VPD	>50	0-2	731-1440		Shallow organic materials are dominant; transition soil from peaty phase gleysols; depths of 60-160 cm dominate.
	Papoose	PO1	TY.F	TY.MF	O^{I}	f-m	-	VPD	>160	0-2	731-1440		PO soils occurs dominantly in the IwC-wS). Derived chiefly from carex species; subject to consistently high water tables and open water areas.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION (IWB): INTERIOR WESTERN HEMLOCK - WESTERN RED CEDAR ZONE (IwH-wC)
: INTERIOR WESTERN RED CEDAR - WHITE SPRUCE ZONE(IwC-wS)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Lacustrine	Bowes Creek	BW1	BR.GL		Lbmt	sil-c	0-1	MWD	>100	0-15	700-1000	McGregor Plateau	BW soils are mapped along the McGregor,Torpy and Jarvis Rivers and occur dominantly in the (IwC-wS).
		BW4	BR.GL	P.GL O.HFP	Lbmt	si-sil sil-c	0-1	WD-MWD	>100	0-15	700-100		Very similar to the Bowron soils and to Raush 4. It is also the transition member to the Dudzic association near the Subalpine forest zone.
		BW7	BR.GL	GL.BR.GL	Lbmt	sil-c	0-1	MWD-ID	>100	0-15	700-1000		Gleyed members are very common throughout the entrenched valleys.
		BW8	BR.GL	.G	Lbmt	sil-c	0-1	MWD-PD	>100	0-10	700-1000		Includes peaty phases of 40 to 60 cm depth.
		BW11	BR.GL	GL.OR	Ls, fCf	sil-c	0-1	WD-ID	>100	5-80	700-1000		Consists of eroding terrace escarpments and fine textured colluvial slumps and fans.
	Raush	RH1	O.GL		Lblm	sic-c	0-1	MWD	>100	0-15	760-1000	Rocky Mountain Trench	RH soils occur dominantly in the (IwC-wS).
		RH3	O.GL	BR.GL O.HFP	Lblm	sic-c	0-1	MWD	>100	0-15	760-1000		Often located adjacent to Subalpine forest zone. Surface horizons are coarser textured and more intensely weathered.
		RH4	O.GL	P.GL LU.HFP	Lblm	$\frac{\text{si-sil}}{\text{sic-c}}$	0-1	MWD	>100	0-15	760-1000		RH4, is a transition member mapped adjacent to Toneko 4. It includes a 20-50 cm si to sil fluvial capping.
		RH7	O.GL	GL.O.GL	Lblm	sic-c	0-1	MWD-ID	>100	0-40	760-1000		Gleyed members are very common especially in hollows of swell and swale topography. Includes gullied lacustrine.
		RH8	O.GL	.G	Lbtm	sic-c	0-1	MWD-PD	>100	0-15	760-1000		Includes peaty phases of 40 to 60 cm depth.

1_ 3 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION (IWB): INTERIOR WESTERN HEMLOCK - WESTERN RED CEDAR ZONE (IwH-wC)
: INTERIOR WESTERN RED CEDAR - WHITE SPRUCE ZONE (IwC-wS)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial	Wendle	WD1	L.O.HFP		Cv	l-sil	40-70	WD-MWD	10-50	15-60+	700-1440	Rocky Mtn. Trench, McGregor Plateau, Rocky Mtns.	WD soils occurs dominantly in the (IwH-wC) zone; often is incorporated with Lanezi till; overlies metamorphics, sedimentaries and minor limestone.
		WD2	L.O.HFP	L.DG.EB L.DG.DYB	Cv	l-sil	40-70	WD-MWD	10-50	15-60+	700-1440		Occurs on south and southwest facing slopes; climatically drier soils; often mapped with Lanezi 2.
		WD5	L.O.HFP	O.HFP DG.DYB	Cbv	l-sil	40-70	WD-MWD	>50	15-60	700-1440		Consists of inclusions of deeper colluvium.
		WD7	L.O.HFP	GL.O.HFP GL.O.HFP	Cbfv	l-sil	40-80	WD-ID	50-100	15-60	700-1440		Includes colluvial aprons and fans at the base of steep slopes; subject to seepage.
		WD11	L.O.HFP	SM.HFP O.MB	Cbv-A	l-sil	40-80	WD-MWD	50-100	15-100	700-1440		Subject to snow avalanching.
Fluvial	Fontoniko	FN1	O.HFP	DG.DYB	Faf	l-s	40-80	WD-MWD	>50	5-40	700-1440		FN soils occur dominantly in the (IwH-wC); FN is commonly located on the floor of the trench adjacent to the steep valley walls; often subject to seepage.
		FN7	O.HFP	GL.O.HFP GL.DYB	Ff; $\frac{Ff}{L}$ - VP	l-s; $\frac{l-s}{sil-HC}$	40-80; $\frac{40-80}{0-1}$	WD-ID	>50	5-40	700-1440		Commonly consists of fluvial fan material over lacustrine; potentially very unstable and may be subject to piping in some locations.
	Guilford	GF1	CU.R		$F^{A}I$	sl-sl	0-10	MWD	>100	0-6	650-725	Rocky Mtn. Trench, McGregor Plateau	GF soils occur dominantly in (IwC-wS); GF1 is located approximately 0-3 m above river levels; subject to seasonal flooding.
		GF2	CU.R	O.R O.EB	$F^{A}I$	sl-sl	0-10	MWD	>100	0-6	650-725		Located approximately 0-15 m above river levels, flooding is less frequent than on GF1; young coniferous forests; some areas are cultivated.
		GF7	CU.R	GL.CU.R GL.O.R	$F^{A}I$	sl-sl	0-10	MWD-ID	>100	0-6	650-825		Sites are subject to lateral seepage and generally higher water tables.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION (IWB): INTERIOR WESTERN HEMLOCK - WESTERN RED CEDAR ZONE (IwH-wC)
: INTERIOR WESTERN RED CEDAR - WHITE SPRUCE ZONE(IwC-wS)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Fluvial (cont'd)	Guilford (cont'd)	GF8	CU.R	.G	$F^{A}l$	sl-sl	0-10	MWD-PD	>100	0-6	650-825	Rocky Mtn. Trench McGregor Plateau	Includes peaty phases of up to 40-60 cm in depth; Includes oxbows and abandoned river channels; occurs extensively up the Torpy and McGregor Rivers.
	Longworth	LO1	P.GL		Flt	l-sil	0-10	MWD	>100	0-5	655-750	Rocky Mtn. Trench	LO soils occur dominantly in (IwC-wS); LO1 is located approximately 10-100 m above river levels; commonly under dense coniferous forest or cultivation.
		LO2	P.GL	DG.DYB O.HFP	Flt	sl-sil	0-30	WD-MWD	>100	0-5	655-750		Consists of coarser textures; transition soil to Toneko 2.
		LO4	P.GL	GL.EB GL.CU.R	Ff Flt	sl-sil	0-30	MWD-ID	>100	0-15	655-750		Soil textures are variable; fluvial fan material is mostly derived from lacustrine escarpments; often subject to seepage.
		LO7	P.GL	GL.PGL	Flt	sl-sil	0-10	MWD-ID	>100	0-5	655-750		Includes seepage areas at the base of the Fraser River escarpments.
		LO8	P.GL	.G	Flt	l-sil	0-10	MWD-ID	>100	0-5	655-750		Includes peaty phases of up to 40-60 cm in depth.
	Ptarmigan	PM1	O.HFP		$F^{G}t$, Ftl	l-ls	20-80	WD	>100	0-15	730-1200	Rocky Mtn. Trench, McGregor Plateau	PM soils occurs dominantly in (IwH-wC); PM1, deep well drained gravelly terraces.
		PM4	O.HFP	P.GL LU.HFP	$F^{G}t$, Ftl	l-ls	20-80	MWD	>100	0-15	730-1200		Often includes stratas of fine materials throughout the fluvial deposit.
		PM7	O.HFP	GL.HFP	$F^{G}t$, Ftl	l-ls	20-80	WD-ID	>100	0-15	730-1200		Includes seepage areas.
		PM8	O.HFP	.G	$F^{G}t$, Ftl	l-ls	20-80	MWD-PD	>100	0-15	730-1200		Includes peaty phases of up to 40-60 cm in depth.
		PM11	O.HFP	OT.HFP	$F^{G}t$, Ftl	l-ls	20-80	MWD	>100	0-15	730-1200		Includes soils with ortstein horizons.

1 - 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION (IWB): INTERIOR WESTERN HEMLOCK - WESTERN RED CEDAR ZONE (IwH-wC)
: INTERIOR WESTERN RED CEDAR - WHITE SPRUCE ZONE(IwC-wS)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Fluvial (cont'd)	Toneko	T01	O.HFP		Fbht, $\mathrm{F^{G}_{bht}}$	l-s	0-3	WD	>100	0-60	720-1200	Rocky Mtn. Trench	TO soils occurs dominantly in (IwC-wS); T01, consists of deep medium sands usually draped over the major lacustrine escarp ments.
		T02	O.HFP	DG.DYB	Fbht, $\mathrm{F^{G}_{bht}}$	l-s	0-3	WD	>100	0-60	720-1200		Commonly mapped adjacent to Longworth 2 along Fraser River escarpment; prone to surface revelling and slumping.
		T04	O.HFP	P.GL LU.HFP	$\frac{\mathrm{Fbv}}{\mathrm{L}}$	$\frac{\mathrm{sl-sil}}{\mathrm{sic-c}}$	0-3	MWD	>100	0-30	720-1200		Consists of a shallow sand capping over lacustrine; often found adjacent to stream coarses and areas subject to post glacial flooding. Transition soil occurring with Raush 4.
		T07	O.HFP	GL.HFP	sFb; $\frac{\mathrm{Fbv}}{\mathrm{L}}$	l-s; $\frac{\mathrm{sl-sil}}{\mathrm{sic-c}}$	0-3	WD-ID	>100	0-30	720-1200		Includes areas with stratigraphy similar to T04. Lacustrine at depth restricts drainage.
Bedrock	Rock	RK4											Limey shale, shale, limestone, dolostone; quartzite; greenstone sills and flows.
		RK5											Quartzite, quartz-pebble conglomerate, siltstone, shale, phyllite.
		RK6											Conglomerate, sandstone, shale, mudstone, phyllite; minor limestone.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal	Bastille	BS1	DG.EB		Mbv	l-cl	20-70	WD-MWD	>50	10-50	1050-1670	Rocky Mtns., Foothills	BS soils are derived dominantly from limestone bedrock; usually calcareous at <50 cm. Surface horizons are often developed in colluvial materials.
		BS3	DG.EB	BR.GL P.GL	Mbv	l-cl	20-70	WD-MWD	>50	10-50	1200-1800		Includes upper subalpine meadows subject to snowpack.
		BS4	DG.EB	BR.GL	Mbv	l-cl	20-70	WD-MWD	>50	10-30	1050-1670		Consists of dominantly basal till with finer textures; common on wide valley floors.
		BS5	DG.EB	L.DG.EB L.BR.GL	Mbv	l-cl	20-70	WD-MWD	10-100+	10-50	1050-1670		
		BS6	L.DG.EB	DG.EB	Mv	l-cl	20-70	WD-MWD	<50	10-50	1050-1670		
		BS7	DG.EB	GL.DG.EB	Mbv	l-cl	20-70	MWD-ID	>50	10-50	1050-1670		Includes seepage slopes.
	Beauregard Mountain	BG1	O.HFP		Mbv	sil-si	10-40	WD	>50	5-30	1050-1650	Rocky Mtns.	BG soils are derived dominantly from schist, phyllite, turbidite and conglomerate.
		BG3	O.HFP	O.FHP	Mbv	sil-si	10-40	WD-MWD	>50	5-30	1050-1650		Commonly occurs in krummholz subzone.
		BG5	O.HFP	L.O.HFP	Mbv	sil-si	10-40	WD-MWD	10-100	5-30	1050-1650		
		BG6	L.O.HFP	O.HFP	Mbv	sil-si	10-40	WD-MWD	<50	5-30	1050-1650		
		BG7	O.HFP	GL.O.HFP	Mbv	sil-si	10-40	MWD-ID	<50	5-15	1050-1650		
	Footprint	FT7	BR.GL	GL.BR.GL	$\frac{\text{Fv}}{\text{Mbv}}$	$\frac{\text{si}}{\text{cl-l}}$	$\frac{\text{0-10}}{\text{20-70}}$	MWD-ID	>50	5-20	1050-1670	Foothills, Rocky Mtns.	FT soils consist of 15-50 cm of sandy capping over moraine.
	Hambrook	HB1	BR.GL		Mbv	cl-l	5-40	WD-MWD	>50	5-30	1050-1650	Foothills, Benchlands	HB soils are formed in basal till, calcareous at depth.
		HB4	BR.GL	DG.DYB	Mbv	l-ls	5-40	WD-MWD	>50	5-30	1050-1650		Includes soils with coarser surface horizons.
		HB5	BR.GI	L.BR.GL	Mbv	cl-l	5-40	WD-MWD	10-100+	5-30	1050-1650		
		HB7	BR.GL	GL.BR.GL	Mbv	cl-l	5-40	WD-ID	>50	5-30	1050-1650		
		HB8	BR.GL	.G	Mbv	cl-l	5-40	MWD-PD	>50	5-15	1050-1650		Includes peaty phases of 40-60 cm in depth.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal (cont'd)	Nekik Mountain	NK1	O.HFP		Mbv	l-sil	20-70	WD-MWD	>50	5-20	1200-1500	Foot-hills, Rocky Mtns.	NK soils are derived dominantly from shale and siltstone bedrock; some areas consist of coarser surface horizons; usually non-calcareous within top metre.
		NK4	O.HFP	BR.GL	Mbv	l-cl	20-70	MWD	>50	5-20	1200-1500		Includes areas of known luvisolic development; includes deeper moraine and finer textures.
		NK5	O.HFP	L.O.HFP	Mbv	l-sil	20-70	WD-MWD	10-100+	5-20	1200-1500		
		NK7	O.HFP	GL.O.HFP	Mbv	l-sil	20-70	MWD-ID	>50	5-20	1200-1500		
		NK6	O.HPP	.G	Mbv	l-sil	20-70	MWD-PD	>50	0-10	1200-1500		
	Onion Creek	ON3	BR.GL	P.GL LU.HFP	Mbv	l-sil	5-40	WD-MWD	>50	5-30	1050-1500		ON soils derived dominantly from limestone bedrock, usually calcareous within 50 cm.
		ON5	BR.GL	L.BR.GL	Mbv	l-sil	5-40	WD-MWD	>50	5-30	1050-1500		
	Paksumo	PK1	O.HFP		Mbv	l-sil	20-60	WD-MWD	>50	5-30	1050-1650	Rocky Mtns.	PK soils occur to a lesser extent in the Interior Wet Belt Region. PK is derived dominantly from quartzites and minor limestone; often includes deposits of coarse blocky quartzite gravels.
		PK3	O.HFP	O.FHP T.DY.B	Mbv-N^{C}	l-sil	20-60	WD-MWD	>50	5-30	1100-1800		Includes upper subalpine meadows, subject to snowpack; included in tree island zone.
		PK4	O.HFP	P.GL LU.HFP	Mbv	cl-sicl	20-60	WD-MWD	>50	5-30	1050-1650		Includes areas of finer textures.
		PK5	O.HFP	L.O.HFP	Mbv	l-sil	20-60	WD-MWD	10-100+	5-30	1050-1650		
		PK6	L.O.HFP	O.HFP	Mv	l-sil	20-60	WD-MWD	<50	5-30	1050-1650		
		PK10	O.R	O.HFP	Mbh	s-l	40-80	WD-RD	>50	10-30	1500-1900		Includes fluvioglacial materials and very coarse textured rubbly moraine, usually occurs above tree line.
		PK11	O.HFP	O.R TU.R	Mbrh-CSN	s-l	40-80	WD-RD	>50	10-40	1500-2000		Recent morainal ridges and terminal moraines.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF) (Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal (cont'd)	Paxton Mountain	PX1	O.HFP		Mbv	sl-l	20-50	WD-MWD	>50	5-30	1500-1900	Rocky Mtns.	PX soils occur subdominantly in the IWB; derived dominantly from limestone, minor quartzite and shales.
		PX3	O.HFP	SM.HFP L.O.HFP	Mbv	sl-l	20-50	WD-MWD	10-100	5-30	1600-2000		Generally occurs in the krummholz subzone and on cirque floors.
		PX10	O.R	GL.O.R	Mbv	s-l	20-80	RD-ID	>50	5-20	1600-2000		Includes fluvioglacial materials and very coarse textured rubbly moraine; usually located above tree line.
		PX11	O.R	TU.R	Mbr-C	s-l	20-80	RD-MWD	>50	5-30	1600-2000		Unvegetated recently delgaciated area; calcareous to surface.
	Robb	RB5	DG.EB	L.DG.EB	Mbv	sl-l	5-40	WD	10-100+	5-30	1050-1650	Foothills	Overlies sandstone and shale.
	Thunder Mountain	TH5	BR.GL	L.BR.GL	Mbv	sl-l	10-40	WD-MWD	>50	5-30	1050-1650	Foothills, Benchlands	Overlies sandstone and shale.
		TH6	L.BR.GL	BR.GL	Mv	sl-l	10-40	WD-MWD	10-100	5-30	1050-1650		
		TH7	BR.GL	GL.BR.GL	Mbv	sl-l	10-40	MWD-ID	>50	5-30	1050-1650		
	Turning Mountain	TM1	O.HFP		Mbv	sl-l	20-60	WD	>50	5-30	1050-1650	Foothills	TM soils overlie sandstone and shale; includes areas of ablation till.
		TM2	O.HFP	DG.DYB	Mbv	sl-l	20-60	WD	>50	5-30	1050-1650		
		TM3	O.HFP	SM.HFP	Mbv	sl-l	20-60	WD	>50	5-30	1200-1850		Borders with krummholz subzone.
		TM4	O.HFP	P.GL LU.HFP	Mbv	sil-l	20-60	WD	>50	5-30	1050-1650		Includes soils of finer textures.
		TM5	O.HFP	L.O.HFP	Mbv	sl-l	20-60	WD	10-100+	5-30	1050-1650		
		TM7	O.HFP	GL.O.HFP	Mbv	sl-l	20-60	WD-ID	>50	5-30	1050-1650		
Organic	Hominka	HA1	TY.F	TY.M	O^{B}Fl	f-m	-	VPD	>100	0-2	1050-1800	Rocky Mtns., Foothills	HA1 soils include peat mosses, bS, Labrador tea; fen-bog transitions are a common feature.
		HA4	.F	T.F T.M	O^{B}Fl	f-m	-	VD	>100	0-2	1050-1800		Inclusions of mineral soil contact at around 60 cm promote willow and sedge species.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF) (Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Lacustrine	Dudzic	DC1	O.HFP		Lbmt	fsl-sl	0-5	MWD-WD	>100	2-10	1050-1600	Rocky Mtns.	DC soils occur to a lesser extent in the IWB; prone to gullying.
		DC2	O.HFP	P.GL BR.GL	Lbmt	fsl-sl	0-5	WD-MWD	>100	2-10	1050-1600		
		DC7	O.HFP	GL.HFP GL.P.GL	Lbmt fCaf	fsl-sl	0-5	WD-ID	>100	2-10	1050-1600		Includes colluviated lacustrine, subject to seepage.
		DC8	O.HFP	.G	Lbmt	fsl-sl	0-5	MWD-PD	>100	2-10	1050-1600		Includes peaty phases up to 40-60 cm in depth.
		DC11	GL.O.HFP	L.O.HFP	Lst	fsl-sl	0-5	ID-MWD	>100	10-60	1050-1600		Includes eroding lacustrine escarpments.
	Framstead	FR1	DG.EB	GL.DG.EB	$\frac{\text{fCfav-VF}}{\text{L}}$	fsl-sil	0-5	ID-MWD	>50	10-40	1000-1200		FR soils occur subdominantly in the IWB. FR1, includes the base of actively slumping lacustrine terraces usually subject to seepage.
		FR3	DG.EB	BR.GL P.GL	$\frac{\text{fCafv-VF}}{\text{L}}$	fsl-sil	0-5	ID-MWD	>50	10-40	1000-1200		Mapped where on-site inspections showed luvisolic development.
		FR4	GL.DG.EB	GL.SM.B	$\frac{\text{fCf}}{\text{Lt}}$ A	fsl-sil	0-15	ID-MWD	>50	10-40	1000-1200		Includes the top of lacustrine terraces which are subject to snow avalanching.
Colluvial	Babette	BB1	O.HFP		Cbfv	ls-sil	20-70	WD	>50	10-40	1050-1800		BB soils occur dominantly in the IWB region; derived dominantly from quartzites; minor inclusions of limestone and shale.
		BB3	O.HFP	SM.HFP SM.B	Cbv-N	ls-sil	20-70	MWD-WD	>50	10-40	1400-1950		Occurs in upper subalpine meadows; krummholz subzone.
		BB4	O.HFP	P.GL LU.HFP	Cbv	sil-sl	20-40	MWD-WD	>50	10-40	1050-1800		Occurs in areas of dominant mudstone and siltstone, minor quartzite.
		BB5	O.HFP	L.O.HFP	Cv	ls-sil	20-70	WD-MWD	10-100+	10-50	1050-1800		
		BB6	L.O.HFP	O.HFP	Cv	ls-s	30-80	WD-RD	<50	10-50	1050-1800		Inclusions of blocky quartzite gravels are common.
		BB7	O.HFP	GL.O.HFP GL.DG. DYB	Cbv	ls-sil	20-70	MWD-ID	>50	10-20	1050-1800		

1- 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial (cont'd)	Babette (cont'd)	BB11	O.HFP	DG.EB DG.DYB	Cbv-A	ls-sl	30-80	W-MW	>50	10-50	1050-1800	Rocky Mtns.	Prone to snow avalanching.
	Becker Mountain	BC1	O.R		Caf	ls-s	>90	RD	>50	>30	1050-1900		BC soils occur subdominantly in the IWB. Talus slope material derived from limestone and dolomites.
		BC5	O.R	L.O.R L.O.EB	Cavb-A	ls-s	>50	RD	10-100	>30	1050-1900		Prone to snow avalanching.
		BC6	L.OR	O.R	Cv-A	ls-s	>50	RD	10-75	>30	1050-1900		Very shallow rubbly scree slopes prone to snow avalanching.
	Blue Lake	BE3	BR.GL	P.GL	Cbv	sicl or sic	10-40	WD	>50	>15	1050-1650		BE soils generally overlies siltstone bedrock.
		BE5	BR.GL	L.BR.GL	Cbv	sicl or sic	10-40	WD	10-100+	>15	1050-1650		
		BE7	BR.GL	GL.BR.GL	Cbv	sicl or sic	10-40	WD-ID	>50	>10	1050-1650		
	Dezaiko	DZ1	O.HFP		Cbv	sil-sl	20-50	WD	>50	>15	1050-1650		DZ soils occur equally in the IWB; overlie fine grained metamorphic bedrock with limestone inclusions.
		DZ3	O.HFP	SM.FHP SM.HFP	Cbv	sil-sl	20-50	WD	>50	>15	1500-1900		Occurs in the upper subalpine and krummholz subzone.
		DZ5	O.HFP	L.O.HFP	Cbv	sil-sl	20-50	WD	10-100+	>15	1050-1650		
		DZ6	L.O.HFP	O.HFP	Cv	sil-sl	20-50	WD	10-100	>15	1050-1650		
		DZ7	O.HFP	GL.O.HFP	Cbv	sil-sl	20-50	MWD-ID	>50	>10	150-1650		Inclusions of lower slopes subject to seepage.
		DZ11	O.HFP	L.O.R SM.HFP	Cbv-A	sil-sl	20-50	MWD-WD	10-100+	>15	1050-1900		Complex soils which include areas subject to avalanching and snowpack; includes scree slopes.
	Hedrick	HK1	O.HFP		Cbv	sil-sl	20-50	WD	>50	>15	1050-1850		HK soils occur subdominantly in the IWB. Generally overlies limestone, dolomite and occasionally quartzite.
		HK3	O.HFP	SM.HFP SM.FHP	Cbv	sil-sl	20-50	WD	>50	>15	1500-1900		Occurs in the upper subalpine and krummholz subzone.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial (cont'd)	Hedrick	HK4	O.HFP	P.GL LU.HFP	Cbv	sic-sil	20-50	MWD	>50	>15	1050-1850	Rocky Mtns.	Includes areas which consist of interbedded siltstone, shales and limestone.
		HK5	O.HFP	L.O.HFP	Cbv	sil-sl	20-50	WD	10-100+	>15	1050-1850		
		HK6	L.O.HFP	O.HFP	Cv	sil-sl	20-50	WD	10-100	>20	1050-1850		
		HK7	O.HFP	GL.O.HFP	Cbv	sil-sl	20-50	MWD-ID	>50	5-30	1050-1850		Inclusions of lower slopes subject to seepage are common.
		HK8	O.HFP	.G	Cbv	sil-sl	20-50	MWD-PD	>50	5-20	1050-1850		Includes peaty phases up to 40-60 cm.
	Horseshoe	HS1	DG.DYB		Cbv	sl-l	20-50	WD	>50	>15	1050-1650	Foot-hills	HS soils overlie sandstone and shale.
		HS2	DG.DYB	O.EB O.DY.B	Cbv	sl-l	20-50	WD-RD	>50	>15	1050-1650		Includes actively eroding escarpments, scree slopes; climatically drier south facing slopes are prevalent.
		HS3	DG.DYB	O.HFP	Cbv	sl-l	20-50	WD	>50	>15	1500-1900		Occurs in the upper subalpine and krummholz subzone.
		HS4	DG.DYB	O.R O.DYB	Cbv	sl-ls	20-50	WD-RD	>50	>15	1050-1650		
		HS5	DG.DYB	L.DG.DYB	Cbv	sl-l	20-50	WD	10-100+	>15	1050-1650		
		HS6	L.DG.DYB	DG.DYB	Cv	sl-l	20-50	WD	10-100	>15	1050-1650		
		HS7	DG.DYB	GL.DYB	Cbv	sl-l	20-50	MWD-ID	>50	5-20	1050-1650		Inclusions of lower slopes subject to seepage.
		HS11	L.DG.DYB	L.O.R L.O.EB	Cbv-A	s-l	20-70	WD-RD	10-100	>30	1050-1900		Actively eroding escarpments and rubbly scree slopes; gullied, often subject to snow avalanching.
	Merrick	MC1	O.HFP		Cbv	sl-l	20-50	WD	>50	>15	1050-1650	Foot-hills, Rocky Mtns.	Overlies sandstone, shale and minor conglomerate.
		MC3	O.HFP	SM.HFP SM.FHP	Cbv	sl-l	20-50	WD	>50	>15	1200-1900		Occurs in the upper subalpine and krummholz subzone.
		MC6	L.O.HFP	O.HFP	Cv	sl-l	20-50	WD	10-100	>15	1050-1650		

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF) (Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial (cont'd)	Merrick (cont'd)	MC11	L.HFP	L.O.R	Cv	sl-l	20-50	RD-WD	10-100	>20	1050-1650	Foothills; Rocky Mtns.	Includes eroding scree slopes, subject to gullying and snow avalanching.
	Minnes	MI1	DG.EB		Cbv	sl-cl	20-40	MWD	>50	>15	1200-1850	Foothills	MI soils overlie shale and sandstone.
		MI2	DG.EB	O.R O.EB	Cbv	sl-cl	20-80	RD-WD	>50	>20	1200-1850		Includes actively eroding scree slopes, usually climatically drier on south facing slopes.
		MI3	DG.EB	DG.MB SM.HFP	Cbv	sl-cl	20-40	MWD	>50	>10	1200-2500		Occurs in the upper subalpine and krummholz subzone.
		MI5	DG.EB	L.DG.EB	Cbv	sl-cl	20-40	WD	10-100+	>15	1200-1850		
		MI6	L.DG.EB	DG.EB	Cv	sl-cl	20-60	WD	10-100	>15	1200-1850		
		MI7	DG.EB	GL.DG.EB	Cbv	sl-cl	20-40	MWD-ID	>50	>15	1200-1850		
		MI10	DG.EB	L.O.R L.O.HF	Cbv	sl-cl	20-80	RD-WD	10-100+	>15	1200-2500		Complex soils; scree slopes subject to gullying and snow avalanching; includes Alpine tundra zone
		MI11	DG.EB	L.TU.R L.TU.S	Cbv-NC	sl-ls	20-80	WD-MWD	10-100+	>15	1200-2400		Includes areas in the Alpine tundra zone; subject to periglacial processes.
	Myhon	MH1	O.MB		Cbv	sl	20-50	WD	>50	>15	1050-1650	Rocky Mtns., Foothills	MH soils occur subdominantly in the IMB; consists dominantly of limestone and dolomite rubble.
		MH4	O.MB	O.R L.O.R	Cbv-A	sl	20-50	WD-RD	10-100	>15	1050-1650		Avalanche area, nonforested.
		MH7	O.MB	GL.OMB	Cbv-A	sl	20-50	MWD-ID	>50	>15	1050-1650		Avalanche runout zones subject to seepage.
	Reesor	RR1	O.SB	DG.DYB	Cbv	sl-sil	20-50	MWD	>50	>9	1650-2000		RR soils occur mainly in the krummholz subzone. Overlies sandstone and shale.
		RR2	O.SB	O.R TU.R	Cbv-A	sl-sil	20-50	MWD	>50	>9	1800-2000		Subject to some active cryoturbation.
		RR3	O.SB	DG.SMB	Cbv	sl-sil	20-50	MWD	>50	>9	1800-2000		Includes areas adjacent to tree island zone.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial (cont'd)	Ressor (cont'd)	RR11	O.SB	O.R TU.R Lithic Sub-groups	Cbv-SHC	sl-ls	20-80	WD	10-100	>9	1800-2000	Rocky Mtns.; Foot-hills	Includes areas of active cryoturbation in a complex with meadows and scree slopes.
	Sheba Mountain	SB1	L.O.MB	DG.EB L.DG.EB	Cv	sl-sil	20-50	MWD	10-100	>9	1550-2000	Rocky Mtns.	SB soils occur mainly in krummholz subzone. Overlies limestone, dolomites and calc. sandstone. SB1 includes drier exposed ridges.
		SB3	L.O.MB	L.O.HFP L.DG.EB	Cv	sl-sil	20-50	MWD	<50	>9	1500-1850		Includes areas of tree islands.
		SB4	L.O.MB	O.R TU.O.R TU.O.MB	Cv-C	sl-sil	20-50	MWD	<50	>9	1650-2000		Complex soils, areas with active cryoturbation, near alpine.
	Tlooki	OO1	O.R		Caf	sl-ls	>70	RD	>50	>30	1050-1850		OO soils occur subdominantly in the IWB. Talus slopes derived from metamorphic bedrock.
		OO6	L.O.R	O.R	Cv-A	sl-ls	>70	RD	10-75	>30	1050-1850		Prone to snow avalanching.
	Torrens	TR1	O.R	O.EB	Cafvb	sl-ls	>50	RD	10-100+	>20	1250-2000	Foot-hills	TR soils consist of fine-grained sandstone, siltstone and shale. Loose scree slopes are common; includes Alpine tundra zones.
		TR5	O.R	L.O.R	Cafv-A	sl-ls	>30	RD	10-100+	>20	1250-2000		Includes eroding scree slopes, often subject to gullying.
		TR6	L.O.R	O.R	Cafv-A	sl-ls	>50	RD	10-100	>20	1250-2000		Includes shallow scree slopes, windswept ridges; small pockets of vegetation are common.
	Wendt Mountain	WT1	DG.EB		Cbv	cl-sl	20-60	MWD-WD	>50	>15	1050-1850	Rocky Mtns.	WT soils overlie limestone, dolomites, some sandstone and shale.
		WT3	DG.EB	O.HFP DG.DYB	Cbv	cl-sl	20-60	WD-MWD	>50	>15	1050-1850		
		WT5	DG.EB	L.DG.EB	Cbv	cl-sl	20-60	WD	10-100+	>15	1050-1850		
		WT6	L.DG.EB	DG.EB	Cv	cl-sl	20-60	WD	10-100	>15	1050-1850		

1 _ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Fluvial	Five Cabin Creek	FC1	BR.GL		F^{G}btr, Fbt	sl-ls	0-60	WD-MWD	>100	0-5	1050-1650	Rocky Mtns., Foothills	FC soils include a range of textures throughout profile; varied stratigraphy.
		FC3	BR.GL	P.GL LU.HFP	F^{G}trb, Ftb	sl-ls	0-60	WD-MWD	>100	0-5	1050-1650		Includes soils which have become podzolized; usually at higher elevations.
		FC4	BR.GL	DG.EB DG.DYB	F^{G}trb, Ftb	sl-ls	0-60	WD-MWD	>100	0-5	1050-1650		Includes soils of coarser textures.
		FC5	BR.GL	L.BR.GL L.O.HFP	F^{G}bv, Fbv	sl-ls	0-60	WD-MWD	10-100+	0-5	1050-1650		
		FC7	BR.GL	GL.BR.GL	F^{G}bv, Fbv	sl-ls	0-60	MWD-ID	>100	0-5	1050-1650		
		FC8	BR.GL	.G	F^{G}bv, Fbv	sl-ls	0-60	MWD-PD	>100	0-5	1050-1650		
	Herrick Pass	HP1	O.HFP		F^{G}brtv	sl-ls	20-70	RD-MWD	>100	0-7	1200-1900	Rocky Mtns.	HP soils occur subdominantly in the IMB; generally coarse textured; overlies the quartzite bedrock zones.
		HP3	O.HFP	O.R TU.R	F^{G}bvr	s-ls	20-70	RD-MWD	>50	0-10	1400-2000		Occurs close to krummholz subzone, often subject to frost heaving; blocky quartzite stones and cobbles are common.
		HP5	O.HFP	L.O.HFP	F^{G}bvr	s-ls	20-70	RD-MWD	10-100+	0-10	1400-1900		Includes rubbly blocky ablation areas; eg. cirque floors.
		HP7	O.HFP	GL.HFP	F^{G}bvr	s-ls	20-70	RD-ID	>50	0-7	1400-1900		
		HP8	O.HFP	.G	F^{G}bv	s-ls	20-50	RD-PD	>50	0-7	1400-1900		Includes sedge meadows and peaty phases of 40-60 cm depth.
		HP11	O.HFP	O.R	F^{G}brv	s-ls	20-80	RD-WD	>100	0-20	1400-2100		Very rubbly and blocky quartzites usually near ablading glaciers.
	Holtslander	HO1	DG.DYB		F^{G}rbt, Fbt	sl-ls	10-50	WD	>100	0-6	1050-1650	Foothills, Rocky Mtns.	Clasts derived dominantly from sandstones, shales and conglomerates with minor limestone.
		HO2	DG.DYB	DG.EB	F^{G}rbt, Fbt	sl-ls	10-50	WD	>100	0-6	1050-1650		
		HO3	DG.DYB	O.HFP	F^{G}rbt, Fbt	sl-ls	10-50	MWD-WD	>100	0-6	1050-1650		Includes areas adjacent to krummholz subzone.
		HO4	DG.DYB	BR.GL	F^{G}rbt, Fbt	sil-sl	10-50	MWD-WD	>100	0-6	1050-1650		

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAeS-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Fluvial (cont'd)	Holtslander (cont'd)	HO5	DG.DYB	L.DG.DYB	F^{G}rbt, Fbt	sl-ls	10-50	WD	10-100+	0-6	1050-1650	Foot-hills Rocky Mtns.,	
		HO7	DG.DYB	GL.DG. DYB	F^{G}rbt, Fbt	sl-ls	10-50	WD-ID	>100	0-6	1050-1650		
		HO8	DG.DYB	.G	F^{G}lbt, Flbt	sl-ls	10-50	MWD-PD	>100	0-6	1050-1650		Includes peaty phases of 40-60 cm depth.
	Knudsen Creek	KN1	CU.R		F^{A}lf	sl-ls	10-70	MWD	>100	0-5	1050-1650		KN soils occur subdominantly in the IWB; generally calcareous, subject to flooding.
		KN2	CU.R	DG.EB DG.DYB	F^{A}lff	sl-ls	10-70	MWD	>100	0-5	1050-1650		Includes some terraces which flood only occasionally.
		KN7	CU.R	GL.CU.R	F^{A}lf	sl-ls	10-70	MWD-ID	>100	0-5	1050-1650		Subject to a fluctuating water table.
		KN8	CU.R	.G	F^{A}lf	sl-ls	10-70	MWD-PD	>100	0-5	1050-1650		Includes peaty phases of up to 40-60 cm in depth.
	Ovington Creek	OV1	O.HFP		F^{G}rbt, Fbt	sl-ls	10-50	WD-RD	>100	0-5	1050-1650	Rocky Mtns.	OV soils occur subdominantly in the IWB; occurs equally in the limestone and quartzite bedrock zones; often consists of up to 50 cm of sands over gravels.
		OV3	O.HFP	O.FHP SM.FHP	F^{G}v, Fbv	sl-ls	10-50	WD-MWD	>50	0-5	1200-1900		Found in cirques and hanging valleys.
		OV4	O.HFP	LU.HFP P.GL	F^{G}bt, Fbt	sl-ls	10-50	WD-MWD	>100	0-5	1050-1650		
		OV5	O.HFP	L.O.HFP	F^{G}fv, Ffv	sl-ls	10-50	WD	10-100	0-5	1050-1650		
		OV6	L.O.HFP	O.HFP	F^{G}v, Fv	sl-ls	10-50	WD	10-100	0-5	1050-1650		
		OV7	O.HFP	GL.O.HFP	F^{G}blf, Fblf	sl-ls	10-50	WD-ID	>100	0-5	1050-1650		
		OV8	O.HFP	.G	F^{G}blf, Fblf	sl-ls	10-50	ID-PD	>100	0-5	1050-1650		Includes peaty phases of up to 40-60 cm in depth.

1 – 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: SUBBOREAL WHITE SPRUCE - ALPINE FIR ZONE: COMMON PAPER BIRCH SUBZONE (sBwS-alF:b)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal	Dominion	DO1	P.GL		Mbv	l-sl	5-30	WD-MWD	>50	2-30	750-1070	Rocky Mtns.	DO soil surfaces often include colluvial materials.
		DO3	P.GL	LU.HFP O.HFP	Mbv	l-sl	5-30	WD-MWD	>50	2-30	750-1070		
		DO5	P.GL	L.O.HFP	Mbv	l-sl	5-30	WD-MWD	10-100+	2-30	750-1070		
		DO7	P.GL	GL.O.HFP GL.P.GL	Mbv	l-sl	5-30	MWD-ID	>50	2-30	750-1070		Includes lower slopes subject to seepage.
		DO8	P.GL	.G	Mbv	l-sl	5-30	MWD-PD	>50	2-30	750-1070		Includes peaty phases from 40-60 cm in depth.
Organic	Chief	CF1	.F		$O^{F}1$	f	-	VPD	>100	0-2	750-915		
		CF4	.F	SP.F	$O^{F}1$	f	-	VPD	>100	0-2	750-915		Fen/Bog transition.
	Moxley	MX1	.F		$O^{B}1$	f	-	VPD	>100	0-2	750-915		
Lacustrine	Bowron	BO1	BR.GL	P.GL	Lbmt	sil or sicl	0-2	MWD	>100	0-15	750-1070		BO1 soils are commonly gullied and prone to horizon.
		BO5	BR.GL	L.P.GL L.BR.GL	Lmtv	sil or sicl	0-2	MWD	10-100+	5-30	750-1070		
		BO7	BR.GL	GL.P.GL GL.BR.GL	Lbmt	sil or sicl	0-2	MWD-ID	>100	0-15	750-1070		
		BO8	BR.GL	.G	Lbmt	sil or sicl	0-2	MWD-PD	>100	0-15	750-1070		Includes peaty phases from 40-60 cm in depth.
		BO11	BR.GL	GL.OR GL.O.EB	Ls,fCf	sil or sicl	0-2	MWD-ID	>100	10-70	750-1070		Usually includes components of eroding terrace escarpments and gullies.
Colluvial	Barton	BT1	O.FHP		Cbv	sil-l	10-40	WD	>50	>30	750-1070		BT soils overlie fine grained metamorphic bedrock.
		BT5	O.FHP	L.O.FHP L.O.HFP	Cbv	sil-l	10-40	WD-MWD	10-100+	>30	750-1070		
		BT7	O.FHP	GL.O.HFP GL.O.FHP	Cbv	sil-l	10-40	MWD-ID	>50	>30	750-1070		Includes lower slopes subject to seepage.
		BT11	O.FHP	SM.HFP GL.O.HFP	Cbv-A	sil-l	10-40	WD-ID	>50	10-30+	750-1070		Avalanche runout zones are dominant.
Fluvial	Abbi Mountain	AB7	O.HFP	GL.O.HFP	Ft	sil-sl	0-2	MWD-ID	>100	2-15	730-910		AB soils are derived from metamorphic rock, usually fine grained.
	McGregor	MG1	GL.O.R	GL.CU.R	$F^{A}l$	l-ls	2-20	ID	>100	0-2	910-1060	Rocky Mtns.	MG soils are subject to seasonal flooding; possible inclusions of calcareous soils; generally non-calcareous.
		MG8	GL.O.R	R.G	$F^{A}l$	l-ls	2-20	ID-PD	>100	0-2	910-1060		Includes abandoned river channels, oxbows and meander scars.
	Ramsey	RM7	O.HFP	GL.O.HFP	$F^{G}th$, Ft	sl-ls	20-80	WD-ID	>100	0-5	910-1060		Often includes sandy capping of at least 15 cm.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAes-alF)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Morainal	Sunbeam	SM1	O.HFP		Mbv	sl-sicl	15-30	WD-MWD	>50	10-40	1200-1700	Rocky Mtn., Cariboo Mtn.	SM soils often have inclusions of colluvial detritus and colluviated till within top 50 cm.
		SM2	O.HFP	BR.GL DG.EB	Mbv	sl-sicl	15-30	WD-MWD	>50	10-40	1200-1460		Includes drier south and southwest facing slopes.
		SM3	O.HFP	O.FHP SM.HFP	Mbv	sl-sicl	15-30	WD-MWD	>50	10-40	1400-1800		Includes subalpine meadows subject to snow pack; located in tree island zone.
		SM4	O.HFP	P.GL, LU.HFP	Mbv	sil-c	15-30	WD-MWD	>50	10-40	1200-1700		Inclusions of heavier textured soils.
		SM5	O.HFP	L.O.HFP	Mbv	sl-sicl	15-30	WD-MWD	10-100+	10-40	1200-1700		
		SM7	O.HFP	GL.O.HFP GL.BR.GL	Mbv	sl-sicl	15-30	MWD-ID	>50	10-30	1200-1700		Includes seepage hollows and long seepage slopes.
		SM8	O.HFP	.G	Mbv	sl-sicl	15-30	MWD-PD	>50	10-30	1200-1700		Includes peaty phases up to 40-60 cm in depth.
		SM11	O.HFP	O.R	Mbrv	sl-sil	20-60	WD-MWD	>50	10-60	>1600		Includes recent morainal ridges in subalpine and alpine cirques.
Organic	Hominka	HA1	TY.F		0^{B}lb	f	-	VPD	>100	0-5	1200-1850		Sphagnum mosses common with sphagno-fibrisol soils.
		HA4	TY.F	T.F T.M	0^{B}lv	f-m	-	VPD	>100	0-5	1200-1850		Shallow organic deposits to a minimum thickness of 40-60 cm.
Lacustrine	Dudzic	DC1	O.HFP		Lbmt	fsl-sl	0-5	WD-MWD	>100	2-10	1050-1600	Rocky Mtns.	DC soils are prone to gullying.
		DC2	O.HFP	P.GL BR.GL	Lbmt	fsl-sl	0-5	WD-MWD	>100	2-10	1050-1600		
		DC7	O.HFP	GL.O.HFP GL.PGL	Lbmt, fCfa	fsl-sl	0-5	WD-ID	>100	2-10			Includes eroded lacustrine subject to seepage.
		DC8	O.HFP	.G	Lbmt	fsl-sl	0-5	MWD-PD	>100	2-10	1050-1600		Includes peaty phases up to 40-60 cm in depth.
		DC11	GL.O.HFP	O.HFP	Lst	fsl-sl	0-5	ID-MWD	>100	10-60	1050-1600		Includes eroding lacustrine escarpments.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAes-alF)
(Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Lacustrine (cont'd)	Framstead	FR1	DG.EB	GL.DG.EB	fCfav-FV / L	fsl-sil	0-5	ID-MWD	>50	2-100	1000-1200	Rocky Mtns.	FR1 soils include the base of actively slumping lacustrine terraces usually subject to seepage.
		FR3	DG.EB	BR.GL P.GL	fCfav-FV / Lt	fsl-sil	0-5	MWD	>50	2-100	1000-1200		Mapped where on-site inspections showed luvisolic development.
		FR4	GL.DG.EB	GL.SM.B	fCf-A / Lt	fsl-sil	0-15	ID-MWD	>50	10-30	1000-1200		Includes the top of lacustrine terraces which are subject to snow avalanching.
	Morkill	ML1	O.EB		Lts-VF	sl-sil	-	WD	>100	20-80	1200-1400		ML soils are found in the upper Morkill valley; they are highly erodible and deeply gullied.
Colluvial	Cushing	CS1	L.O.R	O.R	Cv-A	ls-l	20-60	WD-MWD	10-100	10-50+	1000-1700	Rocky Mtns., Cariboo Mtns.	CS soils includes very active avalanching, very shallow soils, generally contains no trees.
		CS2	L.O.R	SM.HFP O.EB	Cbv-A	ls-l	20-60	WD-MWD	10-100	10-50+	1000-1700		Includes vegetated strips of alnus and/or mature wS adjacent to avalanche chutes; complex soils.
		CS4	O.R	GL.GL GL.EB	Cv / Fb,Lb	ls-l / sil-sl	20-60 / 0-10	MWD-ID	>100	5-15	1000-1300		Includes runout zones over fluvial and lacustrine filled valley floors.
		CS6	L.OR		Cv-A	ls-l	20-60	WD-ID	10-50	10-60+	1000-1700		Includes very steep rock slopes; bedrock exposures very common.
		CS7	O.R	GL.EB GL.OR	Cbf-A	ls-l	20-60	MWD-ID	>100	10-50	1000-1500		Includes avalanche runout zones subject to seepage; coarse rubbly colluvial deposits.
	Holliday	HL1	O.HFP		Cbv	l-ls	20-60	WD-MWD	>50	15-80	1000-1800		HL soils often consist of colluvium derived partly from morainal; HL is commonly mapped with the Sunbeam association.
		HL2	O.HFP	O.EB SM.HFP	Cbv	l-ls	20-60	WD-MWD	>50	15-80	1000-1800		This member is mapped on drier south and southwest facing slopes.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION: SUBALPINE ENGELMANN SPRUCE - ALPINE FIR ZONE (SAes-alF) (Continued)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial (cont'd)	Holliday (cont'd)	HL3	O.HFP	SM.HFP O.FHP	Cbv-N	sl-sic	20-60	WD-MWD	>50	10-20	1600-2000	Rocky Mtns.; Cariboo Mtns.	Includes open subalpine meadows subject to snow pack; (located in tree island zone).
		HL4	O.HFP	P.GL LU.HFP	Cbv	sl-sil	15-40	MWD	>50	10-40	1000-1800		Includes heavier textured materials, (eg.) slopewash and mudflows.
		HL5	O.HFP	L.O.EB L.O.HFP	Cbv	l-ls	20-60	WD-MWD	10-100	15-80	1000-1800		
		HL6	L.O.HFP	O.HFP	Cv	l-ls	20-60	WD-MWD	<50	15-80	1000-1800		Includes very shallow soils.
		HL7	O.HFP	GL.O.HFP	Cbv	l-ls	20-60	MWD-ID	>50	10-20	1000-1800		Slopes subject to seepage.
		HL11	L.O.HFP	SM.HFP O.SM.B	Cbv-A	l-ls	20-60	MWD	<100	10-100	1000-1800		Includes steeper slopes subject to snow avalanching.
	Tlooki	OO1	O.R		Caf	sl-ls	>70	RD	>50	>30	1000-1900		OO soils includes Talus slope material derived from metamorphic bedrock.
		OO6	L.O.R	O.R	Cafv-A	sl-ls	>70	RD	10-100	>30	1000-1900		Subject to snow avalanching.
Fluvial	Forgetmenot	FG1	O.HFP		Ft; $F^{G}t$	l-ls	20-40	RD-WD	>50	2-5	1000-1900		FG soils are moderately well sorted to poorly sorted terraces from 2-15 m above stream levels.
		FG4	O.HFP	P.GL LU.HFP	Ft; $F^{G}t$	l-ls	20-40	RD-WD	>50	2-5	1000-1500		Includes silts from adjacent river terraces.
		FG7	O.HFP	GL.O.HFP	Ft; $F^{G}t$	l-ls	20-40	WD-ID	>50	2-5	1000-1500		Includes fans with active seepage.
		FG8	O.HFP	.G	Ft; $F^{G}t$	l-ls	20-40	WD-PD	>50	2-5	1000-1500		Includes peaty phases of up to 40-60 cm in depth.
	Renshaw	RN1	O.R	CU.R	$F^{A}l$	s-sl	2-20	WD-MWD	>100	2-5	1000-1500		RN soils are subject to seasonal flooding; generally calcereous.
		RN7	O.R	GL.O.R .G	$F^{A}l$	s-sl	2-20	MWD-PD	>100	2-5	1000-1500		Includes abandoned channels and oxbows; some inclusions of non-calcareous soils.

1_ 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE SUBBOREAL REGION: ALPINE TUNDRA ZONE (At)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	($)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE ($)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial	Gable Mountain	GM1	L.O.R	L.TU.O.R L.MB	CvC	sl-sil	20-80	MWD	10-50	>9	>1650	Rocky Mtns.	GM soils are derived mainly from agrillite, siltstone and limestone.
		GM3	O.R	TU.SMB	Cbv-C	sil-l	20-80	MWD	10-50	>9	>1650		Includes deeper, heavier textured soils.
		GM4	L.TU.R	TU.R	Cv-C	sl-sil	20-80	MWD	10-50	>9	>1650		Exposed ridges subject to intense frost action.
	Menagin	MN1	O.R		Cbv-SNC	s-sl	30-80	WD-RD	>50	6-30	>1800		MN soils occur subdominantly in the IWB; generally consists of quartzite, rubble and gravels with inclusions of limestone and shale fragments.
		MN2	O.R	L.O.HFP O.HFP	Cb-N	sl-sil	30-50	MWD-WD	>50	6-30	>1600		Subject to less intense frost action, occurs just above tree line.
		MN3	O.R	L.TU.R	Cbv-CS	sl-ls	30-80	WD-RD	>50	6-30	>1900		Exposed, windswept ridges, cryoturbation prevalent.
		MN4	O.R	L.O.HFP L.O.R	Cbv-SNC	sl-ls	30-80	WD-RD	>50	6-30	>1800		Very coarse blocky rubble and gravels; occurs just above tree line.
	Paisson	PL1	TU.OR		Cbv-CS	sl-sil	20-80	MWD	>50	>9	>1650	Foothills	PL soils overlie sandstones and shales.
		PL3	TU.OR	TU.O.SB	Cbv-C	sl-sil	20-80	MWD	>50	>9	>1650		Includes alpine meadows.
		PL6	L.TU.OR	TU.O.R	Cv-C	sl-sil	20-80	MWD	0-100	>9	>1650		Includes very shallow exposed ridges.
	Tsahunga	TS1	L.O.R	L.TU.O.R	Cv-C	sl-sil	20-80	MWD	10-50	>9	>1650	Rocky Mtns.	TS soils occur subdominantly in the IWB. Overlies limestone dolomites, some conglomerate; subject to cryoturbation.
		TS4	TU.O.R	L.TU.O.R TU.O.MB	Cbv-C	sl-sil	20-80	MWD	10-100	>9	>1650		Subject to cryoturbation and other periglacial processes; includes alpine meadows.
Bedrock	Rock	RK1											Generally non-calcareous sandstone and shale.
		RK2											Limestone, dolomite, calcareous sandstones and shale; minors of siltstone and quartzite.
		RK3											Conglomerates.
		RK4											Metamorphics.
		RK5											Quartzite, quartz-pebble conglomerate, siltstone, shale, phyllite.

1– 8 see explanatory footnotes page 214.

SOIL ASSOCIATIONS OF THE INTERIOR WET BELT REGION: ALPINE TUNDRA ZONE (At)

SURFICIAL MATERIAL	SOIL ASSOCIATION	SOIL[1] ASSOC. COMP. SYMBOL	MODAL[2] SOIL DEV'L	ASSOC.[2] SOIL DEV'L	TERRAIN[3] SYMBOL	CDA[4] TEXTURE (<2 mm)	(%)[5] COARSE FRAGMENTS (by vol.)	DRAINAGE[6] CLASS	DEPTH TO BEDROCK (cm)	COMMON[7] SLOPE RANGE (%)	COMMON ELEVATION RANGE (m)	PHYSIO-[8] GRAPHIC REGION(S)	REMARKS
Colluvial	Teare Mountain	TE1	L.TU.R		Cbv-SNC	sl-sil	20-80	WD-MWD	10-100	20-50	>1900	Rocky Mtns., Cariboo Mtns.	Includes very exposed sites subject to intense frost action; minor inclusions of moraine are common in this association.
		TE2	L.TU.R	L.O.HFP	Cbv-SNC	sl-sil	20-80	WD-MWD	10-100	20-50	>1900		Subject to less in tense frost heaving than TE1; alpine heather communities are common.
		TE4	L.TU.R	O.SM.B SM.HFP	Cbv-SN	sl-sil	20-80	MWD	10-100	5-20	>1900		Includes damp depressional meadow sites; often subject to snow avalanching and snow pack; morainal materials are very common inclusions.
Bedrock		RK4											Limey shale, shale, limestone, dolostone; quartzite; greenstone sills and flows.
		RK5											Quartzite, quartz-pebble conglomerate, siltstone, shale, phyllite.
		RK6											Conglomerate, sandstone, shale, mudstone, phyllite; minor limestone.
Ice		I			I, Ib								Areas of snow and ice where evidence of active glacier movement is present; cirque glaciers, mountain icefields.

1- 8 see explanatory footnotes page 214.

EXPLANATORY FOOTNOTES FOR SOIL LEGEND (APPENDIX A)

1. SOIL ASSOCIATION COMPONENTS

A soil association is a group of related soils developed on similar parent materials, which differ due to changes such as soil depth, soil drainage, soil textures, aspect, etc. Soil association components describe these differences between soils within the association.

Soil Component Number	Description
1.	This is the modal or most commonly occurring soil within this association. This soil is the only significant soil found within the areas mapped by component 1. Other components contain the modal soil and an equal or less common soil. Components 6, 10, and 11 are exceptions as they contain only a minor portion of the modal soil. For example, HL1, O.HFP.
2.	Associated soil(s) are drier due to factors such as: slightly coarser textures, southern exposures, or location in a slightly drier local climate (such as a rain shadow or south and west facing slopes). For example, HL2, O.HFP with inclusions of O.EB and SM.HFP soils.
3.	Associated soil(s) are wetter due to factors such as: higher elevations, northerly aspects, or location in areas of slightly higher rainfall than the modal soil. For example HL3, O.HFP with inclusions of SM.HFP an O.FHP soils.
4.	Associated soil(s) have a different soil profile development due to significant textural variations within the normal soil profile (such as a clay loam horizon within a profile which normally has sandy loam textures through depth). For example, HL4, O.HFP with inclusions of P.GL and LU.HFP soils.
5.	Subdominant soil(s) are more shallow to bedrock than the modal soil. For example HL5, O.HFP with inclusions of L.OEB and L.OHFP.
6.	Shallow to bedrock soils are dominant with the modal soil being subdominant. For example HL6, L.O.HFP with inclusions of O.HFP.
7.	Subdominant soil(s) are gleyed due to the effects of seepage, seasonally high watertables and/or slowly permeable fine textured soil horizon(s). These soils are periodically saturated. For example HL7, O.HFP, with inclusions of GL.O.HFP.
8.	Equally common soils are Gleysolic; such soils are subject to prolonged saturated soil conditions. For example. SM8, O.HFP with equal inclusions of Gleysolic soils.
10.	Most common soils usually lack soil development due either to their location on recently deglaciated terrain or to the result of active erosional processes. For example PX10, O.R with inclusions of GL.O.R.
11.	Most common soils are those characterized by snow avalanching and/or erosional processes such as slumping, periglacial processes, slope failure and gullying.

2. LIST OF ABBREVIATIONS FOR 1973 REVISED SOIL CLASSIFICATION SYSTEM.

SUBGROUP & GREAT GROUP are separated by a period when written together, e.g. DG.DYB; DG is the subgroup and DYB the great group. When there are two or more subgroup modifiers, they are also separated by a period.

SUBGROUP

BR	Brunisolic
CU	Cumulo, Cumulic
D	Dark
DG	Degraded
FI	Fibric
GL	Gleyed
L	Lithic
LU	Luvisolic
OT	Orthic
OR	Ortstein
P	Podzolic
R	Rego
SM	Sombric
SP	Sphagno
T	Terric
TU	Turbic
TY	Typic

GREAT GROUP & ORDER

.BR	Brunisol
.DYB	Dystric Brunisol
.EB	Eutric Brunisol
.F	Fibrisol
.FHP	Ferro Humic Podzol
.G	Gleysol
.GL	Gray Luvisol
.HFP	Humo Ferric Podzol
.HG	Humic Gelysol
.LG	Luvic Gleysol
.M	Mesisol
.MB	Melanic Brunisol
.R	Regosol
.SB	Sombric Brunisol

3. TERRAIN SYMBOLS*

- Genetic Materials:

C	Colluvial
E	Eolian
F	Fluvial
L	Lacustrine
M	Morainal
O	Organic
U	Undifferentiated

- Surface Expressions:

a	apron
b	blanket (>1 meter over bedrock)
f	fan
h	hummocky
l	level
m	subdued
r	ridged
s	steep
t	terrace
v	veneer (<1 meter over bedrock)

- Qualifying Descriptors:

A	active
B	bog
F	fen
G	glacio-

- Process Modifiers:

- A	snow avalanching
- C	cryoturbation
- N	nivation
- P	piping
- S	solifluction

Examples:

$\mathrm{F}^{\mathrm{G}}\mathrm{t}$ - glaciofluvial terrace

$\mathrm{Cv}^{-}\mathrm{C}$ - colluvial veneer undergoing cryoturbation

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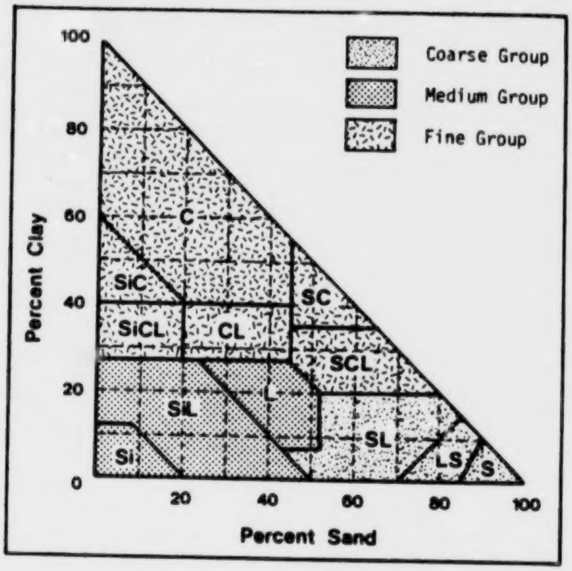
* For a complete description of the terrain classification system refer to: Terrain Classification. 1976. E.L.U.C. Secretariat, Resource Analysis Unit (Surveys and Resource Mapping Branch), Victoria, B.C.

4. TEXTURE*

c	clay
cl	clay loam
sic	silty clay
sicl	silty clay loam
si	silt
sil	silt loam
l	loam
fsl	fine sandy loam
sl	sandy loam
ls	loamy sand
s	sand


Coarse Group
Medium Group
Fine Group
Percent Clay
Percent Sand
100
80
60
40
20
0
20
40
60
80
100
C
SiC
SC
SiCL
CL
SCL
L
SiL
SL
Si
LS
S

Textural Triangle from Lardeau Report

* For more detail refer to: Canada Department of Agriculture. 1974. System of Soil Classification for Canada, Ottawa, Ontario.

5. COARSE FRAGMENTS

% Coarse Fragments (by vol.)	CDA Texture Modifier
0 - 20	(no modifier used)
20 - 50	gravelly (i.e. gls, gsil)
50 - 90	very gravelly (i.e. vgls, vgs)
>90	gravels (no CDA Texture used)

6. DRAINAGE CLASSES*

RD Rapidly Drained - The soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions. Soils are free from any evidence of gleying or mottling throughout the profile. Rapidly drained soils often occur on steep slopes.

WD Well drained - The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year. Soils are usually free from mottling in the upper 1 m, but may be mottled below this depth.

MWD Moderately well drained - The soil moisture in excess of field capacity remains for a small but significant period of the year. Soils are often faintly mottled in the lower B and C horizons or below a depth of 0.76 m. The Ae horizon, if present, may be faintly mottled in fine textured soils and in medium textured soils that have a slowly permeable layer below the A and B horizons. In grassland soils the B and C horizons may be only faintly mottled and the A horizon may be relatively thick and dark.

ID Imperfectly drained - The soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year. Soils are often distinctly mottled in the B and C horizons; the Ae horizon, if present, may be mottled. The matrix generally has a lower chroma than in the well drained soil on similar parent material. Soils are generally "gleyed" subgroups of mineral soil orders.

PD Poorly drained - The soil moisture in excess of field capacity remains in all horizons for a large part of the year. The soils are usually strongly gleyed. Except in high chroma parent materials, the B, if present, and upper C horizons usually have matrix chromas of 3 or less; prominent mottling may occur throughout. Soils are generally in the Gleysolic or Organic order.

VPD Very poorly drained - Free water remains at or within 30 cm of the surface most of the year. The soils are usually strongly gleyed. Subsurface horizons usually are of low chroma and yellowish to bluish hues. Mottling may be present within 30 cm or at depth in the profile. Soils are generally in the Gleysolic or Organic order; mineral soils are usually a peaty phase.

* Describing Ecosystems in the Field, RAB Technical Paper 2. Province of British Columbia. Ministry of Environment.

7. SLOPE

Slope Range (%)	Topographic Classes (on soil maps) Simple Slope	Complex Slope
0 - 1/2	A	a
1/2 - 2	B	b
2 - 5	C	c
5 - 9	D	d
9 - 15	E	e
15 - 30	F	f
30 - 60	G	g
>60	H	h

8. PHYSIOGRAPHIC REGIONS

Foothills	Rocky Mountain Foothills
Rocky Mtns.	Rocky Mountains
Trench	Rocky Mountain Trench
McGregor Plateau	McGregor Plateau
Cariboo Mtns.	Cariboo Mountains

For more detail, refer to: Holland, S. 1976. Land forms of British Columbia: A Physiographic Outline. British Columbia Department of Mines, Victoria, British Columbia (Bulletin No. 48).

APPENDIX B

INTRODUCTION TO METHODOLOGIES AND SOIL INTERPRETATIONS

APPENDIX B

INTRODUCTION TO METHODOLOGIES AND SOIL INTERPRETATIONS

Soil associations are interpreted in the following appendices for various land uses. It is important to realize that these interpretations are based on an analysis of biophysical soil characteristics only and that other considerations, including socio-economic factors, must also be assessed before more meaningful comparisons can be made.

Soil associations and soil association components are described in Chapter Three. The following interpretations are intended for those who use the 1:50 000 scale soil maps. Parts of this appendix is extracted from Vold 1977, Biophysical Soil Resources and Land Evaluation of the Northeast Coal Study Area 1976-1977. Volume One.

Soils are one of the basic resources to consider when planning land use activities. If soil resources are properly used and managed, construction and maintenance costs, as well as the costs of environmental degradation, can be kept to a minimum.

Soils vary in type and severity of limitations as sites for forestry, wildlife, recreational and engineering activities. Some soils have severe limitations for one or more uses, while others may be well suited for a number of uses. Therefore, knowledge of soil characterisitics is basic to good planning and management which attempts to optimize the mix of resource uses.

Biophysical soil interpretations provide relative predictions of soil performance based on field observations and laboratory information. These predictive ratings are intended to serve as input into the planning process and are not intended as recommendations for land use.

When using soil interpretive ratings, the following must be considered:

1. Interpretations do not eliminate the need for on-site evaluations by qualified professionals.
2. Soil interpretations only consider those parameters implicit in the definition of each soil association. Other important limitations may exist that were not considered.
3. When applying soil interpretations to map units, users must realize that, due to the variable nature of soils, small inclusions of unmappable (due to scale) soils may be present.
4. Severe soil ratings do not necessarily imply that a site cannot be changed to remove, correct, or modify the soil limitations. The use of soils rated 'severe' depends on the kind of limitations, whether or not the soil limitations can be altered successfully and economically, and the scarcity of good sites.
5. Methods or criteria used to interpret soils for most land uses are an approximation based on current information available. Users are encouraged to modify or change these methods when further experience warrants it.

SOIL INTERPRETIVE CLASSES

Soil interpretations are usually expressed in terms of the nature and degree of soil limitations or suitability for the intended use. Soil suitability ratings are simply expressed as high, moderate, low, or nil; or, as good, fair, poor, or unsuited. Ratings of slight, moderate, and severe are used to designate the degree of soil limitations. The latter interpretive ratings can be summarized as follows:

i) slight limitations: recognized in soils that have properties favourable for the rated use. Soil limitations are minor and can easily be overcome. Good performance and low maintenance can be expected on these soils.

ii) moderate limitations: recognized in soils that have properties with some significant limitations for use. Limitations can be overcome or modified with special planning, design, or maintenance. Soils with this rating may require treatment to modify limiting features.

iii) severe limitations: recognized in soils that are ill-suited for the rated use because of one or more unfavourable soil properties. Limitations are relatively more difficult and costly to modify or overcome, requiring special design, major soil reclamation, or intense maintenance.

Soil capability ratings are also provided for forestry uses, by using the seven capability classes defined by the Canada Land Inventory (1970). These and other interpretations are discussed in more detail in that interpretive section.

APPENDIX C

METHODOLOGIES AND SOIL INTERPRETATIONS FOR ENGINEERING

APPENDIX C

METHODOLOGIES CONCERNING SOIL INTERPRETATIONS FOR ENGINEERING

INTRODUCTION

Relatively detailed interpretations are provided in Appendix C for soil association components and are to be used with the 1:50 000 scale soil maps. These interpretations provide only a general indication of site characteristics, and on-site inspection is required.

Soil limitation ratings are provided for septic tank absorption fields, shallow excavations, dwellings without basements, local roads and streets. Soil suitability ratings are also provided for road fill, gravel and sand sources, and topsoil. Soil parent material textures are also translated into the AASHO and Unified Soil Classification schemes.

Interpretations for erosion hazard potential and unsurfaced logging roads are provided in Appendix D on forestry.

METHODS

All interpretations in this section are based on guidelines prepared by the U.S.D.A. Soil Conservation Service (1971); they provide guide sheets and text which explain in detail each interpretation provided in this section. Therefore, only a relatively brief discussion of each interpretation is provided.

Septic Tank Absorption Fields

Ratings for septic tank absorption fields are based on the ability of the soil to filter and absorb sewage effluent. Criteria for the ratings include permeability, hydraulic conductivity, percolation rate, flooding frequency, slope, stoniness and depth to an impervious layer (e.g. bedrock) as outlined in U.S.D.A. Soil Conservation Service (1971) Guide Sheet 3. It is assumed that the subsurface tile system is laid such as to uniformly distribute the effluent, and that, for slight limitations, the water table and/or impervious layer is at least 1.2 metres below the tile.

The guide was changed to include possible contamination of water courses and ground water, using texture and permeability as criteria. Contamination hazards are most likely in areas with a high permeability (e.g. greater than 12.7 centimetres/hour) adjacent to water courses, such as coarse-textured fluvial and glaciofluvial deposits, or in areas of seepage.

For the purposes of this study, permeability, hydraulic conductivity and percolation rate values were not measured, but were inferred from textural data, soil development and field inspection. The ratings do not preclude the necessity of on-site evaluation, nor does a severe rating mean septic tanks cannot be installed but rather indicates the degree of difficulty in installment and maintenance.

Shallow Excavations

The ratings are designed to evaluate the soil for excavations or trenches to a depth of 1.5 to 1.8 metres, such as those needed for installation of underground utilities. Criteria are based on the ease of excavation, workability, resistance to sloughing and flooding hazard, and, therefore, consider drainage, seasonal water tables, flooding frequency, slope, texture, depth to bedrock and stoniness. The rating must be evaluated with respect to the specific use. For instance, additional information such as shrink-swell potential and corrosivity is needed for ratings for pipelines. U.S.D.A. Soil Conservation Service (1971) Guide Sheets were used to determine ratings.

Dwellings Without Basements

The ratings apply to single family dwellings without basement, or structures that require similar foundations. Buildings more than three stories or having greater foundation requirements are not considered. Factors considered important for the evaluation of the soils are drainage, seasonal water table, flooding frequency, shrink-swell potential, texture, potential frost action, stoniness and depth to bedrock. Rockiness is not included, but can be determined for a given map unit based on the amount of rock complexed with the soil. These factors, as outlined in Guide Sheet 6 (U.S.D.A. Soil Conservation Service, 1971) with the exception of shrink-swell potential, were used to determine the rating.

Local Roads and Streets

The ratings apply to construction and maintenance of local roads and streets that have all-weather surfacing. Highways designed for fast moving, heavy trucks are excluded from this rating. Properties that affect design and construction of roads and streets are:

(a) those that affect the load supporting capacity and stability of the subgrade; and,

(b) those that affect the workability and amount of cut and fill.

The AASHO and Unified Classification and the shrink-swell potential give an indication of traffic supporting capacity. Wetness and flooding affect stability. Slope, depth to bedrock, stoniness, rockiness and wetness affect the ease of excavation and the amount of cut and fill to reach an even grade. These factors, with the exception of shrink-swell potential, are considered in the ratings, as defined in the U.S.D.A. Soil Conservation Service (1971) Guide Sheet 10.

Source of Road Fill

The ratings apply to the suitability of the soil for use as road fill for low enbankments, where soil is removed from its original location. Criteria used to evaluate the material with respect to these considerations are texture, susceptibility to frost action, slope, stoniness and drainage. The U.S.D.A. Soil Conservation Service (1971) Guide Sheet 11 was employed to determine the ratings. Depth to bedrock is not listed in the Guide Sheet but the suitability was considered poor if the depth of material was less than one metre.

Sand and Gravel Source

The ratings are designed to point out the probability of sizable quantities of sand and/or gravel. Good or fair suitabilities must have probable sources greater than one metre thick. U.S.D.A. Soil Service (1971) Guide Sheet 12 was employed to determine ratings.

Source of Topsoil

The term topsoil describes material used to cover barren surfaces exposed during construction so as to improve soil conditions for re-establishment and maintenance of vegetation and also to improve conditions in already established vegetation. The soils are rated in terms of characteristics which are favourable to plant growth, and the ease or difficulty of the actual excavation. Factors considered in the ratings include consistence, texture, thickness of suitable material, percent coarse fragments, stoniness, slope and drainage, as outlined in U.S.D.A. Soil Conservation Service (1971) Guide Sheet 13.

Frost Action

Frost action were determined by modifying U.S.D.A. Soil Conservation Service (1971) guidelines as follows:

	Frost Action Class		
	Low	Moderate	High
Unified Soil Classes	GW, GP,[1] GW-GM, GP-GM, SW, SP SW-SM, SP-SM	GM, GC,[2] SC, CH, SM (medium sands)	ML, MH, OL, OH, CL, SM (fine sands)

[1] These soils are rated as moderate in the Alpine zone or Subalpine krummholz subzone.

[2] These soils are rated as high in the Alpine zone or Subalpine krummholz subzone, or when imperfectly to poorly drained.

Frost action ratings are provided for each soil association component in Appendix C and are used as limitations for several engineering interpretations in this section and also for forestry interpretations in Appendix D.

[1] Key to Abbreviated Terms on Table C.1

CF - Coarse fragments; excess stones, rubble or boulders may impose limits to use.
Depth - Depth of soil to bedrock is shallow, limiting certain uses.
Frost - Frost or freeze; soils are prone to frost heaving.
Perm - Permeability; the capacity of the soil to transmit water internally is limited.
Slope - Slope(s) may be excessively steep and impose limits to certain uses.
Text - Texture; soil textural limitations such as a soil high in silt or clay can impose limits to use.
Wet - Excess soil wetness or soil drainage restrictions can impose limitations to use.
WT - Watertable influence; seasonal or permanently high water tables may limit use.

Table C.1 Soil Interpretations for Engineering

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMINANT
ABBL MTN. AB7	Severe: WT[1]	Severe: WT, wet	Moderate: wet, frost	Moderate: wet, frost	Fair: wet, frost text	Poor	Good to Fair: slope, text	H	sl-sl	A-4 to A-2-4	SM,SC NL,CL	ML
BABETTE BB1	Severe: slope[1]	Moderate to Severe: slope	Moderate to Severe: slope, frost	Severe: slope, frost	Fair to Poor: slope	Fair to Poor	Poor: slope, CF	h	sl-sl gsl-gsl	A-1	GW-GM SW-SM	GW
BB3	Severe: slope	Moderate to Severe: slope	Moderate to Severe: slope, frost	Severe: slope, frost	Fair to Poor: slope	Fair to Poor	Poor: slope, CF	H				
BB5	Severe: depth, slope	Severe to Moderate: depth, slope	Severe to Moderate: slope, depth	Severe: slope, frost	Fair to Poor: slope	Fair to Poor	Poor: slope, CF	H				
BB6	Severe: depth, slope	Severe: depth, slope	Severe: slope, depth	Severe: slope, frost	Poor: slope	Fair to Poor	Poor: slope, CF	H				
BB7	Severe: perm, slope	Moderate to Severe: wet, slope	Moderate to Severe: wet, slope, frost	Moderate to Severe: wet, slope, frost	Poor: slope	Fair to Poor	Poor: wet, CF	H				
BARTON BT1	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope, frost	Fair to Poor: slope, frost	Poor to: Unsuited	Poor: slope	M-H	sl-l gsl-l	A-4 A-2-4	GM,GC, SM,SC	SM
BT5	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth frost	Fair to Poor: slope, depth, frost	Poor to Unsuited	Poor: slope	M-H				
BT7	Severe: slope, wet	Severe: slope	Severe: slope, wet, frost	Severe: slope, wet, frost	Poor: wet, slope	Poor to Unsuited	Poor: wet, slope	H				
BT11	Severe: slope, depth	Severe: slope, wet, WT	Severe: slope, wet, frost	Severe: slope, wet, frost	Fair to Poor: slope, wet, frost	Poor to Unsuited	Poor: slope	H				
BASTILLE BS1	Moderate to Severe: slope,[1] perm	Moderate: slope	Slight to Moderate: frost, slope	Slight to Moderate: frost, slope	Good to Fair: frost	Poor to Unsuited	Poor to Fair: CF, slope	M	gl, cl-gcl, gsl	A-1-b A-2-4	GC, SC, CL	GC

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED RANGE	UNIFIED DOMINANT
BASTILLE (Cont'd) BS3	Severe to Moderate: slope,[1] perm	Severe to Moderate: slope	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Good to Poor: frost, slope	Poor to Unsuited	Poor to Fair: CF, slope	M				
BS4	Severe to Moderate: slope, perm	Moderate: slope	Slight to Moderate: frost, slope	Moderate: frost, slope	Fair to Good: frost	Poor to Unsuited	Poor to Fair: CF, slope	M-H				
BS5	Severe to Moderate: depth, perm	Severe to Moderate: depth, slope	Slight to Severe: slope, depth	Moderate to Severe: slope, depth	Good to Fair: frost, depth	Poor to Unsuited	Poor to Fair: CF, slope	M				
BS6	Severe: slope, depth	Severe to Moderate: slope, depth	Moderate to Severe: depth, slope	Severe to Moderate: slope, depth	Poor to Fair: depth, slope	Poor to Unsuited	Poor: depth, CF, slope	M				
BS7	Moderate to Severe: wet, perm	Severe to Moderate: wet, slope	Moderate: frost, wet	Moderate: frost, wet	Good to Fair: wet, frost	Poor to Unsuited	Poor to Fair: CF,	M-H				
BEAUREGARD MTN. BG1	Slight to Severe: slope,[1] perm	Slight to Severe: slope	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Good to Fair: text, frost	Poor	Poor: CF, slope	M-H	sl-sl gsl-gsl	A-2-4	GM,GC SM,SC	SM
BG3	Moderate to Severe: slope, perm	Slight to Severe: slope	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Good to Fair: depth, text, frost	Poor	Poor: CF, slope	H				
BG5	Moderate to Severe: slope, depth, perm	Moderate to Severe: slope, depth	Moderate to Severe: slope, depth, frost	Moderate to Severe: slope, depth frost	Good to Fair: text, depth, frost	Poor	Poor: CF, slope	M-H				
BG6	Severe: depth, slope, perm	Severe: depth, slope	Severe: depth, slope, frost	Severe: depth, slope frost	Fair: depth, text, frost	Poor	Poor: CF. slope	M-H				
BG7	Severe: perm, slope	Moderate to Severe: wet, slope,	Moderate to Severe: wet, slope, frost	Moderate to Severe: wet, slope, frost	Fair: wet, text, frost	Poor	Poor: CF, slope	H				

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMINANT
BECKER MTN. BC1	Severe: slope,[1] perm	Severe: slope, text	Severe: slope, stony	Severe: slope, stony	Poor: slope	Good	Poor: slope, CF	L	vgls-rubble land type	A-1 A-3	GP,GW	GP
BC5, 6	Severe: slope, depth, perm	Severe: slope, depth, text	Severe: slope, depth, stony	Severe: slope, depth, stony	Poor: slope, depth	Good	Poor: slope, CF	L				
BLUE LAKE BE3	Severe: slope,[1] perm	Severe: slope, text	Severe: slope, text frost	Severe: slope, frost text	Fair to Poor: slope, text	Unsuited	Poor: slope, text	H	sc-scl gsc-gscl	A-7	MH ML,CL, SC	ML-CL
BE5	Severe: slope, depth, perm	Severe: slope, depth	Severe: slope, depth, text, frost	Severe: slope, depth text, frost	Fair to Poor: slope, depth, text, frost	Unsuited	Poor: slope, text, depth	H				
BE7	Severe: slope, perm	Severe to Moderate: depth, text, frost	Severe to Moderate: depth, frost, text	Severe: slope, frost	Fair to Poor: text, frost, wet	Unsuited	Poor: text, wet	H				
BOWES CREEK BW1, 4	Severe: perm[1]	Severe to Moderate: text, wet	Moderate to Severe: wet, frost	Moderate to Severe: frost, wet	Poor to Fair: text, frost	Unsuited	Poor: Consistance	H	C-HC	A-7-5	MH ML-CL	MH
BW7	Severe: perm, WT	Severe: wet	Severe: wet, frost	Severe: wet, text, frost	Poor: text, wet, frost	Unsuited	Poor: Consistance	H				
BW8	Severe: perm, WT	Severe: WT, wet	Severe: WT, wet	Severe: WT, wet	Poor: WT, wet	Unsuited	Poor: text, wet	H				
BW11	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Poor: slope, wet	Unsuited	Poor: slope, wet	H				
BOWRON BO1, 5	Severe: perm[1]	Moderate: wet	Moderate: frost	Moderate to Severe: text, frost	Fair to Poor: text, frost	Unsuited	Fair: Consistance	H	sl,scl gsl-gsl	A-4	CL	-
BO7	Severe: perm, wet	Severe: wet	Moderate: frost, wet	Moderate: wet, text, frost	Fair to Poor: text, frost	Unsuited	Fair: Consistance	H				

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
BOWRON (cont'd) BO8	Severe: perm,[1] wet	Severe: wet	Severe: wet, frost	Severe: wet, text, frost	Poor: text, wet, frost	Unsuited	Poor to Fair: wet, consistence	H				
BO11	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Unsuited	Poor: slope, wet	H				
CATFISH CREEK CC, 1, 4, 5, 6,	Severe: WT[1]	Severe: wet, WT	Severe: wet, text	Severe: wet, text	Poor: wet, text	Unsuited	Poor: wet, text	H	f		Pt	Pt
CHIEF CF1, 4	Severe: WT[1]	Severe: wet, WT	Severe: wet, text	Severe: wet, text	Poor: wet, text	Unsuited	Poor: wet, text	H	f		Pt	Pt
CUSHING CS1, 2, 6	Severe: slope,[1] depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Fair to Poor: slope	Poor	Poor: text, slope	H-M	gls-gl vgls-vgl	A-1-b A3	SM-SC	SM
CS4, 7	Severe: slope, wet	Severe: slope	Severe: slope	Severe: slope, wet	Poor: slope, wet	Poor	Poor: wet, slope					
DEZAIKO DZ1, 3	Severe: slope[1]	Severe: slope, text	Severe: slope	Severe: slope	Moderate to Severe: slope	Poor	Poor: slope, CF	M	gsl-gsl	A-4 A-2-4	SM,SC	SM-SC
DOMINION DO1,3	Slight to Severe: slope[1]	Slight to Severe: slope	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Fair: text, frost	Poor	Fair to Poor: CF, slope	M	l-sl gl-gsl	A-2-4	SM,SC	SM
DO5	Moderate to Severe: slope, depth	Moderate to Severe: slope, depth	Moderate to Severe: slope, depth, frost	Moderate to Severe: slope, depth, frost	Fair: text, frost	Poor	Fair to Poor: CF, slope	M				
DO7, 8	Moderate to Severe: wet, slope	Moderate to Severe: wet, slope	Moderate to Severe: wet, frost, slope	Moderate to Severe: wet, frost, slope	Fair to Poor: wet, frost, slope	Poor	Poor: CF, wet, slope	M-H				
DUDZIC DC1, 2	Moderate to Severe: perm[1]	Moderate: text	Moderate: frost	Moderate to Severe: text, frost	Fair: text, frost	Unsuited	Good to Fair: text	H	fsl-s	A-4	ML	ML
DC7, 8	Severe: wet, perm	Severe: wet, text	Severe: wet, frost	Severe: wet, frost, text	Severe: wet, text, frost	Unsuited	Poor: wet, text					

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
FARMSTEAD FR1, 3, 4	Severe: slope,[1] perm	Severe: text, slope, frost	Severe: frost, slope, text	Severe: frost, slope, text	Poor: frost, text, slope	Unsuited	Poor: text, slope	H	fsl-sil	–	SM,ML	
FIVE CABIN CREEK FC1, 3, 4	Severe: perm[1]	Slight to Severe: text	Slight	Slight	Good	Good to Poor	Poor: CF	L-M	sl-ls to vgsl-vgls		SM,SP GM,GP	GM
FC5	Severe: perm, depth	Moderate to Severe: depth, text	Moderate: depth	Moderate: depth	Good to Fair: depth	Good to Poor	Poor: CF	L-M				
FC7, 8	Severe: perm, WT	Moderate to Severe: wet, text	Slight to Severe: wet	Slight to Severe: wet	Good to Poor: wet	Good to Poor	Poor: CF, wet	M				
FONTONIKO FN1	Severe: perm,[1] slope	Severe: WT, slope	Severe: WT, slope	Severe: wet, slope	Good to Poor: wet, slope	Good to Poor	Poor: CF, wet	L-M	gl-gs vgl-vgs			
FN7	Severe: perm, slope	Severe: WT, slope	Severe: WT, slope	Severe: wet, slope	Good to Poor: wet, slope	Good to Poor	Poor: CF, wet	L-M				
FOOTPRINT FT7	Severe: perm,[1] WT, slope	Moderate to Severe: wet, slope, text	Moderate to Severe: wet, slope, text	Moderate to Severe: wet, slope, frost	Fair to Poor: wet, slope, frost	Poor to Unsuited	Good to Poor: depth, slope	H	cl-sl gcl-gsl	A-4 A-6 A-7	ML,CL SM,SC	ML
FORGETMENOT FG1, 4	Slight:[2] perm[1]	Slight to Severe: text	Slight	Slight	Good	Good to Poor	Poor: CF	L-M	l-sl		SM,SP GM,GP	GM
FG7, 8	Slight:[1] perm, WT	Moderate to Severe: wet, text	Slight to Severe: wet	Slight to Severe: wet	Good to Poor: wet	Good to Poor	Poor: CF, wet	M				
GABLE MOUNTAIN GM1, 3, 4	Severe: depth,[1] slope	Severe: depth, slope	Severe: depth, slope, frost	Severe: depth, slope, frost	Fair to Poor: slope, frost	Fair to Unsuited	Poor: wet	H	sl,ls gsl,gls	A-4 A-2-4	SM,SC	SM
GUILFORD GF1, 2	Severe: flooding, WT[1]	Severe: flood, WT, wet	Severe: flood, wet, frost	Severe: flood, wet, frost	Fair: text, wet	Unsuited	Fair: text	H	sl-sl	–	ML,CL	ML
GF7	Severe: flood, WT	Severe: flood, WT, wet	Severe: flood, wet, frost	Severe: flood, wet frost	Fair to Poor: text, wet	Unsuited	Poor: wet	H			GP,GM	

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
											UNIFIED	
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	RANGE	DOMI-NANT
HAMBROOK HB1, 4	Moderate to Severe: slope,[1] perm	Moderate to Severe: slope, text	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Fair: text, frost	Poor to Unsuited	Poor: CF, slope	M-H	cl-l gcl-gl	A-4 A-6		
HB5	Moderate to Severe: slope, depth, perm	Moderate to Severe: slope, depth, text	Moderate to Severe: slope, depth, frost	Moderate to Severe: slope, depth, frost	Fair: text, depth, frost	Poor to Unsuited	Poor: CF, slope	M-H				
HB7, 8	Moderate to Severe: WT, slope, perm	Moderate to Severe: wet, slope	Moderate to Severe: wet, slope, frost	Moderate to Severe: wet, slope, frost	Fair to Poor: wet, text, frost	Poor to Unsuited	Poor: CF, wet, slope	H				
HEDRICK HK1, 3	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope	Fair to Poor: slope	Unsuited	Poor: CF, slope	M	sl-l gsl-gl	A-6,4	SM,SC GC	SM,SC
HK4	Severe: slope	Severe: slope, text	Severe: slope, frost	Severe: slope, frost	Poor: slope, frost	Unsuited	Poor: text, slope	H	slc-sil gslc-gsl	-	-	-
HK5, 6	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Fair to Poor: slope, depth	Unsuited	Poor: CF, slope	M	sl-l gsl-gl	A-6,4	SM,SC GC	SM,SC
HK7, 8	Severe: slope, WT, wet	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Fair to Poor: slope, wet	Unsuited	Poor: CF, wet, slope	M-H				
HERRICK PASS HP1	Severe: perm[1]	Moderate: CF, text	Slight to Moderate: frost, CF	Slight to Moderate: CF, frost	Good to Fair: CF, frost	Fair	Poor: CF	M	gsl-gls vgsl-vgls	A-2-4	SW-SM	-
HP3	Severe: perm	Severe: CF, text	Severe: CF, frost	Severe: CF, frost	Poor: CF	Fair to Poor	Poor: CF					
HP5	Severe: perm	Severe: CF, text, depth	Severe: CF, text, depth	Severe: CF, frost	Poor: CF	Fair to Poor	Poor: CF					
HP7, 8	Severe: wet, WT	Severe: CF, wet	Severe: CF, wet	Severe to Moderate: wet, WT, CF	Good to Poor: wet, CF	Fair to Poor	Poor: wet, CF	M-H				
HOMINKA HA	Severe: WT[1]	Severe: wet, WT	Severe: wet, text	Severe: wet, text	Poor: wet, text	Unsuited	Poor: wet, text	H	f		Pt	Pt

1– 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
HOLLIDAY HL1, 2	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope	Fair to Poor: slope, frost	Poor	Poor: slope, CF	M	l-ls gl-gls	A-2-4	SM,SC	SM
HL3, 4	Severe: slope	Severe: slope	Severe: slope, frost	Severe: slope, frost	Poor: slope, frost	Poor	Poor: slope, CF	H				
HL5, 6	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Poor: slope	Poor	Poor: slope, CF	M				
HL7,11	Severe: slope, depth, wet	Severe: slope,depth, wet	Severe: slope, depth	Severe: slope, depth	Poor: slope	Poor	Poor: slope, CF	M				
HOLTSLANDER HO1, 2, 3, 4	Moderate to Severe: perm[1]	Moderate: text	Slight: frost	Slight: frost	Good: frost	Fair to Poor	Poor: CF	M	sl-lsl gsl-gls		SM,GM SP,GP	GM
HO5	Moderate to Severe: perm	Moderate: text, depth	Slight: frost, depth	Slight: frost, depth	Good: frost	Fair to Poor	Poor: CF	M				
HO7, 8	Moderate to Severe: perm, WT	Moderate: wet, text	Moderate: wet, frost	Moderate: wet, frost	Fair: wet, frost	Fair to Poor	Fair to Poor: CF, wet	M-H				
HORSESHOE HS1, 2, 3, 4	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope	Moderate to Severe: slope	Fair to Poor	Poor	M	gsl-gl	A-2-4 A-4	SM,SC GM,GC	SM-SC
HS5, 6	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Moderate to Severe: slope, depth	Fair to Unsuited	Poor	M				
HS7	Severe: slope, WT	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Moderate to Severe: slope, wet	Fair to Poor: slope, wet	Poor	M-H				
HS11	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Fair to Poor	Poor	M-H				
KNUDSEN CREEK KN1	Severe:[2] flood[1]	Severe: flood	Severe: flood	Severe: flood	Good	Good to Fair	Poor: CF, thin topsoil	L-M	sl-ls to vgsl-vgls	A-1 A-2-4	GM,GP SM,SP	SP
KN2	Moderate[2] to Severe: flood	Moderate to Severe: flood	Severe: flood	Moderate to Severe: flood	Good	Good to Fair	Poor to Fair: CF, thin topsoil	L-M				

1- 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
											UNIFIED	
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	RANGE	DOMI-NANT
KNUDSEN CREEK (cont'd) KN7, 8	Severe:[2] flood	Severe: flood, wet	Severe: flood, wet	Severe: flood, wet	Good	Good to Fair	Poor: CF, thin topsoil					
LANEZI LZ1, 2, 4	Moderate to Severe: slope,[1] perm	Slight to Moderate: text, perm, slope	Moderate: frost, slope	Moderate to Slight: slope, frost	Fair: frost, text	Unsuited	Fair to Poor: CF, consistance	M	sc-l gsc-gl	A-4 A-6	ML,CL	-
LZ5	Moderate to Severe: slope, perm, depth	Moderate to Severe: depth, slope, perm	Moderate: frost, slope, depth	Moderate to Slight: slope, frost	Fair: frost, text	Unsuited	Fair to Poor: CF, consistance	M				
LZ7, 8	Severe: WT, perm	Severe: WT, slope	Severe: WT	Severe: perm, frost	Poor: wet	Unsuited	Poor: wet, CF, consistance	H				
LONGWORTH LO1, 2	Moderate to Severe:[2] Wt, perm[1]	Moderate to Severe: WT, perm	Moderate to Severe: WT, flood	Moderate to Severe: wet, frost	Fair to Poor: wet, frost	Unsuited	Good	H	l-sil	A-4	ML ML-CL	ML
LO4	Severe:[2] WT, perm	Severe: WT, perm	Severe: WT, flood	Severe to Moderate: WT, frost	Poor to Fair: wet, WT frost	Unsuited	Good	H				
LO7, 8	Severe:[2] WT, perm	Severe: WT, perm	Severe: WT, flood	Severe: WT, frost	Poor: wet, WT frost	Unsuited	Good	H				
McGREGOR MG1	Severe:[2] flood, WT[1]	Severe: flood, WT, wet	Severe: flood, wet, frost	Severe: flood, wet, frost	Fair: text, wet	Unsuited	Poor: thin topsoil	H	sl-fsl	A-6	ML-CL	ML-CL
MG8	Severe:[2] flood, WT	Severe: flood, WT wet	Severe: flood, wet frost	Severe: flood, wet, frost	Fair to Poor: text, wet	Unsuited	Poor: wet, thin topsoil	H				
MENAGIN MN1	Severe: perm,[1] CF, frost	Severe: slope, CF	Severe: slope, CF	Severe: slope, depth	Poor: slope, CF	Fair	Poor: CF, tex	M	gsl, vgsl, vgls	$\frac{\text{A-1-b}}{\underline{\text{A3}}}$	GM, SW-SM	GM
MN2, 3, 4	Severe: depth, perm, CF	Severe: depth, CF, slope	Severe: slope, CF, depth	Severe: depth, CF, slope	Poor: slope, depth	Fair	Poor: CF, tex					

1- 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
MERRICK MC1, 3	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope	Fair to Poor: slope	Fair to Poor	Poor: CF, slope	M	si-l gsi-gl	A-6,4 A-2-4	SM,SC GC	SM-SC
MC5, 6	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Fair to Poor: slope, depth	Poor to Unsuited	Poor: CF, slope	M				
MC7	Severe: slope, WT[1]	Severe: slope, wet	Severe: slope, wet	Severe: slope, wet	Fair to Poor: slope, wet	Unsuited	Poor: CF, wet, slope	M-H				
MINNES MI1, 2, 3	Severe: slope[1]	Severe: slope	Severe: slope, frost	Severe to Moderate: slope, frost	Fair: slope, frost	Unsuited	Fair to Poor: slope, CF	H-M	si-cl gsi-gcl	A-4	ML-CL	-
MI5, 6	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth, frost	Severe: slope, frost	Fair: slope, frost	Unsuited	Poor: slope, CF	H-M				
MI7	Severe: WT, slope	Severe: WT, slope	Severe: WT, slope	Severe: slope, frost	Poor: slope, frost	Unsuited	Poor: slope, CF	H				
MI10, 11	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth, frost	Severe: slope, frost	Poor: slope, frost	Unsuited	Poor: slope, CF	H				
MORKILL ML1	Severe: slope[1]	Severe: slope, text	Severe: slope, text	Severe: slope, text	Poor: frost, slope	Unsuited	Poor to Fair: slope	M-H	si-sli	A-4	ML	
MOXLEY MX1, 4	Severe: WT	Severe: WT, wet	Severe: wet, text, frost	Severe: wet, text, frost	Poor: wet, text, frost	Unsuited	Poor: wet, text	H	f		Pt	Pt
MYHON MH1	Severe: slope,[1] perm	Severe: slope, text	Severe: slope, frost	Severe: slope, frost	Fair to Poor: slope, frost	Poor to Unsuited	Poor: slope, CF	M-H	gsi-vgsi	A-2-4 A-4	ML,CL SM,SC	SM-SC
MH4	Severe: slope, depth, perm	Severe: slope, depth, text	Severe: slope, depth, frost	Severe: slope, depth, frost	Fair to Poor: slope, depth, frost	Poor to Unsuited	Poor: slope, CF	M-H				
MH7	Severe: slope, perm, WT	Severe: slope, wet, text	Severe: slope, wet, frost	Severe: slope, wet, frost	Fair to Poor: slope, wet,	Poor to Unsuited	Poor: slope, CF	H				

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED RANGE	UNIFIED DOMINANT
NEKIK MOUNTAIN NK1, 4	Moderate: slope,[1] depth	Moderate: wet, slope	Slight to Moderate: slope, frost	Slight: frost	Fair to Poor: frost, depth	Unsuited	Fair: CF, slope	M	sli-gsli slcl	A-1-b A-2-4	SC ML-CL	SC
NK5	Severe to Moderate: depth, slope	Severe to Moderate: depth, slope	Moderate: depth, frost	Slight: frost	Poor: depth	Unsuited	Poor to Fair: CF, depth					
NK7	Moderate: depth, WT	Severe to Moderate: Wet, depth	Moderate: wet, frost	Moderate to Severe: drainage, frost	Fair to Poor: frost, depth, drainage	Unsuited	Fair: CF					
NK8	Severe: WT	Severe: wet, WT	Severe: wet, frost	Severe: wet, frost	Poor: wet, WT	Unsuited	Poor: WT, wet					
ONION CREEK ON3	Slight to Severe: slope[1]	Slight to Severe: slope, text	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Good to Fair: slope, frost	Poor to Unsuited	Poor: CF, slope	M	l-sl gl-gsl	A-4	SC,SM ML	SC
ON5	Slight to Severe: slope, depth	Slight to Severe: slope, depth, text	Slight to Severe: slope, depth, frost	Slight to Severe: slope, depth, frost	Good to Poor: slope, depth, frost	Poor to Unsuited	Poor: CF, slope	M				
OVINGTON CREEK OV1, 3	Slight to Moderate:[2] perm[1]	Slight to Severe: text	Slight: frost	Slight: frost	Good: frost	Good to Poor	Good to Poor: CF	L-M	sl-ls vgsl-vgls	A-1-a A-4 A-2-4	SM,SP GP,GM GP,GM	GM
OV4	Slight to Moderate:[2] perm	Slight to Moderate: text	Slight: frost	Slight: frost	Good: frost	Good to Poor	Good to Poor: CF	L-M	sl-ls gsl-gls	A-2-4	SM,GM SP	SM
OV7, 8	Severe:[2] perm, WT	Slight to Severe: wet, text	Slight to Severe: wet, frost	Slight to Severe: wet, frost	Good to Poor: wet, frost	Good to Poor	Good to Poor: CF, wet					
PAKSUMO PX1, 3	Slight to Severe: slope,[1]	Slight to Severe: slope, CF	Slight to Severe: slope, CF	Slight to Severe: CF, slope	Fair: frost, slope, CF	Poor	Poor: CF, slope	M	gsl-gl vgsl-vgl	A-2-4	SM,SC SM-SC	SM
PX10, 11	Severe: slope, CF, perm	Severe: CF, slope, frost	Severe: CF, frost, slope	Severe: CF, frost	Poor to Fair: frost, CF	Poor	Poor: CF, slope	H				

1- 8 see explanatory footnotes page 230.

[2] Potential of pollution to stream water.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED RANGE	UNIFIED DOMINANT
PALSSON PL1, 3	Severe: slope, perm[1]	Moderate to Severe: slope, text	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Fair to Poor: slope, frost	Poor to Unsuited	Good: CF	H	gsl-gsl vgsl-vgls	A-1-a A-2-4 A-4	SM,SC GP GM-GC	GM-GC
PL6	Severe: depth, slope, perm	Severe: depth, slope, text	Severe: depth, slope, frost	Severe: depth, slope, frost	Fair to Poor: depth, slope, frost	Poor to Unsuited	Poor: CF	H				
PAPOOSE PO1	Severe: WT[1]	Severe: wet, WT	Severe: wet, text	Severe: wet, text	Poor: wet, text	Unsuited	Poor: wet, text	H	f-m		Pt	Pt
PAXTON MOUNTAIN PX1, 3	Slight to Severe: slope[1]	Moderate to Severe: slope, text	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Good to Fair: slope, frost	Poor	Poor: CF	H	gsl-gl	A-2-4	SM,SC GM,GC	SM
PX10, 11	Severe: slope	Severe: slope, text	Severe: slope, frost	Severe: slope, frost	Good to Fair: slope, frost	Poor	Poor: CF	H				
PTARMIGAN PM1, 4, 11	Severe to Slight:[2] perm[1]	Slight to Moderate: slope, CF	Slight	Slight	Good	Good	Poor: CF	L	gl-g vgl-vg	A-1 A-1-a A-1-b	GW,GP	-
PM7, 8	Moderate to Severe:[2] WT, wet	Moderate to Severe: WT, CF	Severe to Moderate: WT, frost	Moderate to Severe: wet, frost	Fair to Poor: wet, frost	Good	Poor: CF, wet	M-H				
RAMSEY RM7	Severe:[2] perm, WT[1]	Moderate to Severe: text, wet	Slight to Moderate: wet, frost	Slight to Moderate: wet, frost	Good to Fair: wet	Good to Poor	Poor: CF	M-L	gsl-gls vgsl-vgls	A-1 A-2-4	SM,GM, SP,GP	SP
RAUSH RH1, 3, 4	Severe: perm[1]	Moderate to Severe: perm, frost	Moderate to Severe: frost	Moderate to Severe: text, frost	Poor: text, frost	Unsuited	Poor to Fair: consistance	H	slc-c	A-7-6	CH,MH	CH
RH7	Severe: wet, perm	Severe: wet, frost	Moderate to Severe: wet, frost	Moderate to Severe: wet, text, frost	Poor: wet, text, frost	Unsuited	Poor: consistance	H				
RH8	Severe: wet, perm	Severe: wet, frost	Severe: wet, frost	Severe: wet, frost	Poor: wet, text, frost	Unsuited	Poor: wet, consistance	H				

1_ 8 see explanatory footnotes page 230.

[2] Potential of pollution to stream water.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMINANT
REESOR RR1, 2, 3	Moderate to Severe: slope, perm[1]	Moderate to Severe: slope, text	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Good to Poor: slope, depth	Poor	Poor: CF, slope	H	gsl-gsl	A-2-4	SM	SM
RR11	Moderate to Severe: slope, depth, perm	Moderate to Severe: slope, depth, perm	Moderate to Severe: slope, depth, frost	Moderate to Severe: depth, frost	Good to Poor: slope, depth	Poor to Unsuited	Poor: CF, slope	H				
RENSHAW RN1	Severe:[2] flood, WT[1]	Severe: flood, WT	Severe: flood, wet, frost	Severe: flood, wet, frost	Fair: text, wet	Unsuited	Poor: thin topsoil	M-H	s-sl	A-4	ML SM,SC	ML
RN8	Severe:[2] flood, WT	Severe: flood, WT, wet	Severe: flood, wet, frost	Severe: flood, wet, frost	Fair to Poor: text, wet	Unsuited	Poor: wet, thin topsoil	H				
ROBB RB5	Slight to Severe: slope, depth,[1] perm	Slight to Severe: slope, depth, text	Slight to Severe: slope, depth, text	Slight to Severe: slope, depth, frost	Fair to Poor: depth, slope, text	Poor to Unsuited	Poor: CF, slope	H	sl-l gsl-gl	A-4 A-6 A-2-4	ML,CL SC,SM	ML-CL
SHEBA MTN. SB1, 3, 4	Severe: depth,[1] slope	Severe: depth, slope, text	Severe: depth, slope	Severe: depth, slope, frost	Poor: depth, slope	Poor to Unsuited	Poor: CF, slope	H	gsl-gsl	A-4	ML-CL SM,SC	ML-CL
SUNBEAM SM1, 2, 3, 4	Moderate to Severe: slope,[1] perm	Moderate to Severe: slope, text	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Fair to Poor: slope, frost	Unsuited	Fair to Poor: consistance, slope	M-H	sl-scl gsl-gsl	A-4	ML,CL SM,SC	ML
SM5	Severe to Moderate: slope, depth, perm	Severe to Moderate: slope, text	Moderate to Severe: slope, frost	Moderate to Severe: slope, frost	Fair to Poor: slope, frost	Unsuited	Fair to Poor: consistance, slope	M-H				
SM7, 8	Severe: WT, wet, perm	Severe: WT, perm	Severe: perm, WT	Severe to Moderate: wet, frost	Fair to Poor: frost, wet	Unsuited	Fair to Poor: wet, slope	H				
SM11	Severe: slope, perm	Severe: slope, CF	Severe: frost, slope	Severe: frost, slope	Poor: frost, CF	Unsuited	Poor: CF, slope	H				

1– 8 see explanatory footnotes page 230.

[2] Potential of pollution to stream water.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
TEARE MTN. TE1, 2, 4	Severe: slope,[1] depth	Severe: slope, depth	Severe: slope, depth, frost	Severe: frost, slope	Fair to Poor: slope, frost	Unsuited	Poor: CF, slope	H	sl-sl gsl-gsl	A-2-4	GM,GC	GM
THUNDER MOUNTAIN TH5, 6	Slight to Severe: slope,[1] depth	Slight to Severe: slope, depth	Slight to Severe: slope, depth, frost	Slight to Severe: slope, depth, frost	Fair to Poor: slope, depth, frost	Poor to Unsuited	Poor: slope, CF	M-H	sl-l gsl-gl	A-4 A-2-4	CL,ML, SC	SC
TH7	Slight to Severe: wet, slope	Slight to Severe: wet, slope	Slight to Severe: wet, slope, frost	Slight to Severe: wet, slope, frost	Fair to Poor: wet, slope, text, frost	Poor to Unsuited	Poor: slope, wet, CF	H-M				
TLOOKI 001	Severe: slope,[1] perm	Severe: slope, text	Severe: slope	Severe: slope	Severe: slope	Poor: slope	Poor: slope, CF	L	vgsl-vgls	A-3 A-1	GP GM	GP
006	Severe: slope, depth, perm	Severe: slope, depth, text	Severe: slope, depth	Severe: slope, depth	Severe: slope, depth	Poor: slope, depth	Poor: slope, CF	L				
TONEKO TO1, 2	Slight to Severe: slope[1]	Slight to Severe: slope	Slight to Severe: slope	Slight to Severe: slope	Fair: slope	Unsuited	Poor to Good: text, slope	L	l-s	A-3	ML	ML
TO4	Moderate to Severe: slope, perm	Slight to Severe: slope	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Fair: slope, frost	Unsuited	Poor to Good: text, slope	L-M				
TO7	Severe to Moderate: WT, wet, slope	Moderate to Severe: wet, WT, slope	Moderate to Severe: WT, frost	Moderate to Severe: wet, frost, slope	Fair to Poor: frost, wet	Unsuited	Poor to Fair: slope, wet	M-H				
TORRENS TR1	Severe: slope[1]	Severe: slope	Severe: slope	Severe: slope, frost	Fair to Poor:	Unsuited	Poor	M	vgsl-vgls	-	-	-
TR5, 6	Severe: depth, slope	Severe: slope, depth	Severe: slope	Severe: slope	Fair to Poor: slope	Unsuited	Poor	M				
TSAHUNGA TS1	Severe: depth, slope,[1] perm	Severe: depth, slope, text	Severe: depth, slope, frost	Severe: depth, slope, frost	Poor: depth, slope, frost	Poor	Poor: CF, slope	H	gsl-gsl vgsl-vgsl	A-2-4 A-4	SM,GM	SM

1_ 8 see explanatory footnotes page 230.

Table C.1 Soil Interpretations for Engineering (Continued)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:				SUITABILITY AS A SOURCE OF:			POTENTIAL FROST ACTION	SOIL TEXTURES			
	SEPTIC TANK ABSORPTION FIELDS	SHALLOW EXCAVATIONS	DWELLINGS WITHOUT BASEMENTS	LOCAL ROADS AND STREETS	BORROW FOR FILL	SAND AND GRAVEL	TOPSOIL		CDA	AASHO	UNIFIED	
											RANGE	DOMI-NANT
TSAHUNGA (cont'd) TS4	Severe to Moderate: slope, depth, perm	Moderate to Severe: slope, depth, text	Moderate to Severe: slope, depth, frost	Moderate to Severe: slope, depth, frost	Fair to Poor: slope, depth, frost	Poor						
TURNING MOUNTAIN TM1, 2, 3, 4	Moderate to Severe: slope,[1] perm	Slight to Severe: slope, text	Slight to Severe: slope, frost	Slight to Severe: slope, frost	Good to Fair: slope, frost	Poor	Poor: CF, slope	M-H	gsi-gi vgsi-vgi	A-3 A-4	GM-GC SM,SC	GM-GC
TM5	Moderate to Severe: slope, depth, perm	Slight to Severe: slope, depth, text	Slight to Severe: slope, depth, frost	Slight to Severe: slope, depth, frost	Good to Poor: slope, depth, frost	Poor	Poor: CF, slope	M-H				
TM7	Moderate to Severe: slope, depth, perm	Slight to Severe: slope, wet, perm	Slight to Severe: slope, wet, frost	Slight to Severe: slope, wet, frost	Good to Fair: slope, wet, frost	Poor	Poor: CF, slope	H-M				
WENDLE WD1, 2, 5	Severe: slope,[1] depth	Severe: slope, depth	Severe: slope	Severe: slope	Fair to Poor: slope, frost	Unsuited	Poor: CF, slope	M	gi-gsi vgi-vgsi	A-i-b A-4	ML,SM SM,SC	ML
WD7	Severe: slope, wet, depth	Severe: slope, wet	Severe: slope, depth, wet	Severe: slope	Fair to Poor: slope, frost	Unsuited	Poor: CF, slope					
WD11	Severe: slope, CF	Severe: slope, CF	Severe: slope, CF	Severe: slope	Poor: slope, frost	Unsuited	Poor: slope, CF					
WENDT MOUNTAIN WT1, 3	Severe: slope,[1] perm	Severe: slope, text	Severe: slope, frost	Severe: slope, frost	Fair to Poor: slope, frost	Fair to Poor	Poor: CF, slope	M	gci-gsi vgci-vgsi	A-i-b A-4	GM-GC SM-SC	SM-SC
WT5, 6	Severe: slope, depth, perm	Severe: slope, depth, text	Severe: slope, depth, frost	Severe: slope, depth, frost	Fair to Poor: slope, depth, frost	Poor to Unsuited	Poor: CF, slope	M				

1–8 see explanatory footnotes page 230.

APPENDIX D

METHODOLOGIES AND SOIL INTERPRETATIONS FOR FORESTRY

APPENDIX D

METHODOLOGIES CONCERNING SOIL INTERPRETATIONS FOR FORESTRY

INTRODUCTION

Relatively detailed interpretations are provided in the following table for biophysical soil association components and are meant to be used with the 1:50 000 scale soil maps for management unit[1] and watershed (folio) development planning. Interpretations provided in the following table only generally indicate potential problems at the operational planning level; for more exact information, on-site investigation is required.

Forest capability, dominant coniferous trees, limitations for regeneration, windthrow hazard, limitations for logging roads and erosion hazard are discussed.

Reimchen *et al*. (1977) have prepared erosion hazard potential maps for the north half of 93I, located north of the study area. Erosion hazard potential was interpreted from surficial material (terrain) maps, with three classes recognized: high (unstable), moderate (metastable), and low (stable).

METHODS

Forest Capability

Methods used to determine the forest capability classification for soils are explained by Kowall (1971). A general discussion of forest capability is available in a Canada Land Inventory publication by McCormack (1972).

Key to Symbols on Table D.4 "Forest Capability"

Capability Classes, Mean Annual Increment
(cubic metres per hectare per year)

Class 1c	15.1 - 18.0
Class 1b	12.1 - 15.0
Class 1a	9.2 - 12.0
Class 1	7.8 - 9.1
Class 2	7.7 - 6.4
Class 3	5.0 - 6.3
Class 4	3.6 - 4.9
Class 5	2.2 - 3.5
Class 6	0.8 - 2.1
Class 7	0.0 - 0.7

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[1] Planning terms used are from Pearse (1976), pp. 261-265.

Capability Subclasses

Except for Class 1, subclasses indicate the kind of limitations for each class. The subclasses are as follows:

CLIMATE:

Denotes a significant adverse departure from what is considered the median climate of the region, that is, a limitation as a result of local climate; adverse regional climate will be expressed by the class level.

Subclass A - droughty or arid conditions as a result of climate.
Subclass C - a combination of more than one climatic factor or when it is not possible to decide which of two or more features of climate is significant.
Subclass H - low temperatures, that is too cold.
Subclass U - exposure.

SOIL MOISTURE:

Denotes a soil moisture condition less than optimum for the growth of commercial forests but not including inundation.

Subclass M - soil moisture deficiency.
Subclass W - soil moisture excess.
Subclass X - a pattern of "M" and "W" too intimately associated to map separately.
Subclass Z - a pattern of wet organic soils and bedrock too intimately associated to map separately.

PERMEABILITY AND DEPTH OF ROOTING ZONE:

Denotes limitations of soil permeability or physical limitation to rooting depth.

Subclass D - physical restriction to rooting by dense or consolidated layers, other than bedrock.
Subclass R - restriction of rooting zone by bedrock.
Subclass Y - intimate pattern of shallowness and compaction or other restricting layers.

OTHER SOIL FACTORS:

Denote factors of the soil which, individually or in combination, adversely affect growth.

Subclass E - actively eroding soils.
Subclass F - low fertility.
Subclass I - soils periodically inundated by streams or lakes.
Subclass L - excessive levels of calcium.
Subclass N - excessive levels of toxic elements such as soluble salts.
Subclass P - stoniness which affects forest density or growth.
Subclass S - a combination of soil factors, none of which, by themselves would affect the class level but cumulatively lower the capability class.

Frost Action

Frost action ratings were determined by modifying existing rating schemes by the USDA Soil Conservation Service (1971) and the Asphalt Institute (1963). The table used for determining potential forst action ratings and the ratings themselves are located in Appendix C on engineering interpretations.

Other soil limitations which affect successful regeneration may be inferred from the forest capability classification in Table D.4. Factors such as soil moisture deficiency/excess, rooting depth, and fertility limations affect both forest growth and regeneration success.

Several potentially significant limitations for regeneration have not been considered, including damping-off hazard, insect damage hazard, rodent damage hazard, and climatic hazards.

Windthrow Hazard

Windthrow hazard ratings were determined by assessing edaphic factors only. Drainage, texture, and effective rooting depth were evaluated before arriving at an overall rating. The following table provides a guide for assessing soil limitations for windthrow hazard:

Table D.1

GUIDE FOR ASSESSING SOIL LIMITATIONS FOR WINDTHROW HAZARD

Items Affecting Use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Drainage	Rapidly, well, and moderately well drained	Imperfectly drained	Poorly and very poorly drained
Texture[1]	Sandy loam, loam, loamy sand, sand	Silt loam, silty clay loam, silty clay	Clay, clay loam, silty clay
Effective Rooting Depth[2]	>100 cm	50-100 cm	<50 cm

[1] Gravelly soil materials would reduce textural limitations one degree.

[2] Depth to bedrock, depth to impervious layer (i.e. Bt), depth to Ck horizon, or restricting water table.

This guide does not take into account other (non-soil) limitations such as winds, stand composition, or management practices which are critical in assessing windthrow hazard in a given area.

The U.S.D.I. Bureau of Land Management (no date) discusses several factors which are important to consider when evaluating windthrow hazard. For example, trees infected with root or butt rots are predisposed to windthrow. Poorly stocked or open stands are generally more windfirm and develop faster with exposure than old stands. Hardwood stands or mixed stands of hardwoods and conifers are generally wind resistant.

In British Columbia, Moore (1975) prepared a review of literature pertaining to blowdown, and Moore (1977) is studying blowdown on streamside leave strips on Vancouver Island.

Limitations for Logging Roads

Soil limitation ratings for unsurfaced logging roads were developed by modifying an existing guide by Craul (1975). The modified guide (Table D.2) reflects the information base available in the study area. Craul discusses the importance of soil items affecting logging roads.

Table D.2

GUIDE FOR ASSESSING SOIL LIMITATIONS FOR LOGGING ROADS

Items Affecting Use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Drainage*	Rapidly, well, and moderately well drained	Imperfectly drained	Poorly and very poorly drained
Flooding**	None	Occasional (less than once in 5 years)	Frequent (more than once in 5 years)
Subgrade*** (a) AASHO Group Index	0-4	5-8	More than 8
(b) Unified Soil Classes	GW, GP, GM, GC, SW, SP, SM, SC	ML CL (PI<15)	MH, CH, OH, OL, CL (PI>15)
Susceptibility to Frost Action***	Low	Moderate	High
Depth to Bedrock*	Deep (>1 metre)	Shallow (50-100 cm)	Thin (<50 cm)
Rockiness****	Bedrock cover <5% surface	Bedrock cover 5-20% surface	Bedrock cover >20% surface
Slope****	0-15% (ABCDE)	15-60% (FG)	>60% (H)

*These items directly available from soils legend.

**Flooding inferred from soil development and landscape position.

***These items are rated in engineering section.

****These items available from soil maps.

Limitation ratings indicate the relative cost and difficulty in constructing and maintaining unsurfaced logging roads. Where soil is rated as having severe limitations, this does not imply that logging roads cannot or should not be constructed, but does indicate that construction and maintenance costs are likely to be very high and alternate routes should be considered.

Erosion Hazard

Erosion hazard ratings were determined by evaluating soil parent material (surficial material) with topographic classes (slope) as follows (Table D.3):

Table D.3

GUIDE FOR ASSESSING SOIL EROSION HAZARD

Surficial Material	Topographic Classes (Slope %)				
	ABCabc (0-5%)	Dd (5-9%)	EFef (9-30%)	Gg (30-60%)	Hh (>60%)
Lacustrine	Moderate	High	High	High	High
Organic	Moderate	High	High	High	High
Morainal (fine-textured)	Moderate	Moderate	High	High	High
Morainal (medium-textured)	Low	Low	Moderate	High	High
Colluvial (cryoturbated)	Low	Low	Moderate	High	High
Colluvial	Low	Low	Moderate	Moderate	High
Fluvial*	Low	Low	Low	Moderate	High

*Erosion by rivers and streams on floodplains is not evaluated here.

Erosion hazard was rated by modifying methods developed by Reimchen *et al.* (1977) and Rutter (1968); they provide a discussion of how surficial materials and slope were assessed to determine erosion potential. Bayrock and Reimchen (no date) have conducted erosion potential studies in the Rocky Mountains and Rocky Mountain Foothills.

Erosion hazard ratings are based on evaluating the natural, undisturbed soil. Several studies, including Kochenderfer (1970), and Swanston (1971), have concluded that erosion problems in forestry are dominantly associated with forest roads. The relative rating of erosion hazard is assumed to remain valid even if modified by development.

Tree Species Indicators

The species which can be expected to yield the volume associated with each class are shown as part of the symbol. Only indigenous species adapted to the region and land are shown. Where only one species indicator is shown in a complex it applies to all classes.

alF - Alpine Fir
D - Douglas Fir
lP - Lodgepole Pine
bS - Black Spruce
bCo - Black Cottonwood
eS - Engelmann Spruce
wS - White Spruce
hyS - Hybrid Spruce

Example of Symbol Conventions for Table D.4

$$\begin{array}{llcl} \text{BB5} & 5^{H} & - & 6^{H}_{R} \\ & \text{alF} & & \text{eS} \\ & & & \text{alF} \end{array}$$

BB5 (Babette Soil Association, 5th member), identifies an area with two general depth ranges, shallow soils, less than 50 cm over bedrock and soils deeper than 50 cm.

The class "5" portion of the symbol with a low temperature (H) subclass, states that the dominant capability is class 5 with significant inclusions of class 6. The class 6 soils include both cold temperature (H) and rooting zone (R) restrictions.

The species indicated are those expected to yield the volume associated with the class.

Note in many areas only one capability rating is given for a soil association member.

Dominant Coniferous Trees

Dominant coniferous tree occurrence is derived from forest zonation descriptions. The tree species indicated are listed in order of their relative dominance based on field observations on various soils. For example, glaciofluvial deposits in the Boreal zone have a soil moisture deficiency for forest growth; lodgepole pine can adapt to these conditions best and is therefore indicated first. The species listed are indicated as options for tree planting or seeding subsequent to forest harvesting and are based on species presently occurring. Exotic species may grow as well or better than indigenous species, thus additional options may exist.

Limitations for Regeneration

Brush competition and potential frost action were the only factors considered in interpreting the limitations for regeneration. Brush competition for each soil type was assessed in the field.

Table D.4
Soil Interpretations for Forestry
(These interpretations are based upon soil related factors only)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD ($ SLOPE)
ABBL MOUNTAIN AB7	S 3 wS	alpine fir, white spruce	Moderate: frost action, brush comp.	Moderate: drainage	Moderate: drainage, subgrade, frost action	Low
BABETTE BB1, 4, 7	5 eS alF		Moderate: frost action	Slight to Moderate: rooting depth, drainage	Moderate to Severe: frost, action, slope	Moderate (<60$) High (>60$)
BB3	H 6 alF				Severe: frost action	
BB5	H H 5 - 6 R alF eS alF			Moderate: depth to bedrock	Moderate to Severe: frost action, depth to bedrock, slope	
BB6				Severe: depth to bedrock	Severe: depth to bedrock, slope (frost action)	
BB11	E H 7 - 6 alF		N.A.	Severe: rooting depth,	Severe: frost action, avalanching, subgrade, drainage	
BARTON BT1	M 4 wS hyS	alpine fir, white spruce	Moderate: frost, action	Slight:	Moderate to Severe: slope, frost action	Moderate (<60$) High (>60$)
BT5				Moderate: rooting depth	Moderate to Severe: slope, depth to bedrock, frost action	
BT7				Moderate: drainage, rooting depth	Moderate to Severe: drainage, slope, frost action	
BT11	E 7	NONE	Severe: avalanching, brush comp.	N.A.	Severe: avalanching, slope	
BASTILLE BS1	H 5 H M eS alF	alpine fir, Engelmann spruce	Moderate: frost action	Moderate: rooting depth	Moderate: frost action, slope	Low (<9$) to Moderate (>9$)
BS3	H 6 alF					

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
BASTILLE (cont'd) BS4	H 5 - 4H M eS eS lP	alpine fir Engelmann spruce	Moderate: frost action	Moderate: rooting depth	Moderate: frost action, slope	Low (<9%) to Moderate (>9%)
BS5	H H 5 - 6 R eS lP alF eS			Moderate: depth to bedrock, rooting depth		
BS6	H H 6 - 5 lP eS eS alF			Moderate to Severe: depth to bedrock, rooting depth	Severe: depth to bedrock, slope, frost action	
BS7	H 4S - 5 wS wS alF			Moderate: drainage, rooting depth	Moderate: frost action, slope, drainage	
BEAUREGARD MOUNTAIN BG1, 3	H H 5 - 4 eS eS alF alF	alpine fir, Engelmann spruce	Moderate: frost action	Slight	Moderate: frost action, slope	Low (<9%) to Moderate (>9%)
BG5, 6	H H 5 - 6 R eS eS alF alF			Moderate: depth to bedrock	Moderate to Severe: depth to bedrock, slope, frost action	
BG7	H H 4 - 5 eS eS alF alF			Moderate: drainage	Moderate: frost action, drainage	
BECKER MOUNTAIN BC1	P 7 R	NONE	N.A.	N.A.	Severe: slope	Moderate (<60%) High (>60%)
BC5, 6					Severe: slope, depth to bedrock	
BLUE LAKE BE3	H 5 - 6H M hyS alF alF	Engelmann spruce, alpine fir	Severe: frost action	Slight	Severe: frost action, subgrade	High
BE5	H H 5 - 6 M R hyS hyS alF alF			Moderate to Severe: depth to bedrock, texture	Severe: frost action, subgrade, depth to bedrock	
BE7	H H 4 - 5 M eS hyS alF			Moderate: texture, rooting depth, drainage	Severe: frost action subgrade, drainage	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
BOWES CREEK BW1, 4, 7	3S - 2S wS wS	white spruce, alpine fir	Moderate to Severe: frost action, brush comp.	Moderate to Severe: texture, drainage, rooting depth	Severe: drainage, frost action, subgrade	Moderate (<5%) High (>5%)
BW8	S W 3 - 7 wS			Severe to Moderate: drainage, texture		
BW11	E S 7 - 4 wS		Severe: slope, drainage, failure	Severe: rooting depth, texture		
BOWRON BO1, 5	3S - 4m wS wS alF alF	white spruce, alpine fir	Moderate: frost action, brush comp.	Moderate: texture	Moderate to Severe: subgrade, frost action	Moderate (<5%) High (>5%)
BO7	3S wS alF			Moderate: texture, drainage	Severe to Moderate: subgrade, frost action, drainage	
BO8	W 5 - 3S wS wS alF			Severe: drainage, texture	Severe to Moderate: drainage, frost action, subgrade	
BO11	E 7 - 4S wS alF			Severe: drainage, texture	Severe: avalanching, drainage, subgrade, frost action	
CATFISH CREEK CC1, 4, 5, 6	W 7	lodgepole pine	Severe: drainage, frost action, brush comp.	Severe: drainage, rooting depth	Severe: drainage, flooding, subgrade	Low
CHIEF CF1, 4	W 7	NONE	N.A.	N.A.	Severe: drainage, flooding, subgrade	Low
CUSHING CS1, 6	E 7	alpine fir, Engelmann spruce	Severe: slope, avalanche, drainage, brush comp.	Severe: rooting depth, drainage	Severe: avalanche, drainage, subgrade, slope	High (>5%)
CS2	E H 7 - 5 eS alF					
CS4, 7	E H 7 - 5 eS alF					

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
DEZAIKO DZ1, 7	H 5 - 4S eS eS alF	Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate to Severe: slope, frost action	Moderate (<60%) to High (>69%)
DZ3	H 6 alF					
DZ5	H H 5 - 6 eS R alF hyS alF			Moderate: depth to bedrock	Moderate to Severe: slope, frost action depth to bedrock	
DZ6	H H 6 - 5 R hyS - eS alF alF			Severe: depth to bedrock	Severe: depth to bedrock, slope	
DZ11	E 7	NONE	Severe: brush comp., avalanching	N.A.	Severe: avalanching, slope, depth to bedrock	
DOMINION DO1, 3	S 2 wS alF	alpine fir, white spruce	Moderate: frost action	Slight to Moderate:	Moderate: frost action	Low (<9%) to Moderate (>9%)
DO5	S S 2 - 3 wS wS alF alF			Slight to Moderate: depth to bedrock	Moderate: frost action, depth to bedrock	
DO7	S 2 wS alF			Slight to Moderate: drainage	Moderate: frost action, drainage	
DO8	S W 2 - 7 wS bS alF			Slight to Severe: drainage	Moderate to Severe: drainage, frost action	
DUDZIC DC1, 2	H H 5 - 4 hyS hyS alF alF	Engelmann spruce, alpine fir	Severe: frost action	Moderate: texture	Severe: frost action, subgrade	Moderate (<5%) High (>5%)
DC7	H 3S - 4 hyS hyS alF alF		Severe: frost action, drainage	Moderate to Severe: drainage, texture		
DC8	W H 5 - 4 hyS hyS					

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
DUDZIC (cont'd) DC11	E S 7 - 4 hyS alF	Engelmann spruce, alpine fir	Severe: frost action, drainage	Moderate to Severe: drainage, texture	Severe: frost action, subgrade	Moderate (<9%) High (>5%)
FIVE CABIN CREEK FC1, 4	H 5 hyS lP	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action	Slight to Moderate: rooting depth	Moderate: frost action	Low
FC3	H 6 alF eS					
FC5	H 5 hyS lP				Moderate: frost action, depth to bedrock	
FC7	H 5 hyS lP			Moderate: rooting depth, drainage	Moderate: frost action, drainage	
FC8	H W 5 - 7 hyS lP				Moderate to Severe: frost action, drainage	
FOOTPRINT FT7	M H 4 - 5 hyS D lP eS alF	Engelmann spruce, alpine fir, lodgepole pine	Severe: frost action	Moderate: rooting depth	Severe: frost action, subgrade	Low (<9%) to Moderate (>9%)
FONTONIKO FN1, 7	3S wS	white spruce, western red cedar	Moderate: frost action, brush comp.	Slight to Moderate: drainage	Moderate to Severe: frost action, drainage, flooding	High (>40%) Low (<15%)
FORGETMENOT FG1	H 4 lP hyS	lodgepole pine, Engelmann spruce, alpine fir	Slight to Moderate: frost action	Slight	Slight	High (>40%) Low (<15%)
FG4, 7	H 3S - 4 hyS lP alF hyS				Slight to Moderate: drainage, frost action	
FG8	W H 5 - 4 hyS hyS alF		Moderate to Severe: frost action	Moderate: drainage	Moderate to Severe: frost action, drainage	
FRAMSTEAD FR1, 3	E 4S - 7 hyS	Engelmann spruce, alpine fir	Severe: frost action, brush comp.	Severe: rooting depth, texture	Severe: slope, frost action	High (>5%)
FR4	E 7 — 4S hyS					

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
GABLE MOUNTAIN GM1, 3, 4	C 7 R	NONE	N.A.	N.A.	Severe: frost action, depth to bedrock	Moderate: (<30%) to High (>30%)
GUILFORD GF1, 7	1b bCo	white spruce	Severe: frost action, brush comp.	Moderate: drainage, texture	Severe: flooding, subgrade	High
GF2	1b - 2I bCo wS					
GF8	1b - 2I bCo bCo wS			Severe: drainage, texture		
HAMBROOK HB1	H 5 D hyS lP	Engelmann spruce, lodgepole pine, alpine fir	Severe: frost action	Moderate: texture, rooting depth	Moderate to Severe: frost action, subgrade	Low (<9%) to Moderate (>9%)
HB4					Moderate to Severe: frost action	
HB5	H 5 R hyS lP				Moderate to Severe: depth to bedrock, frost action, subgrade, drainage	
HB7	H H 4 - 5 hyS D hyS lP			Moderate: texture, drainage rooting, depth	Moderate to Severe: frost action, subgrade, drainage	
HB8	H W 5 - 7 D bS hyS					
HEDRICK HK1, 4	H 5 hyS alF	Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate to Severe: frost action, (slope)	Moderate (<60%) High (>60%)
HK3	H 6 alF					
HK5	H H 5 - 6 R hyS hyS alF alF			Moderate: depth to bedrock	Moderate to Severe: frost action, depth to bedrock, slope	
HK6				Severe: depth to bedrock	Severe: depth to bedrock slope, (frost action)	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
HEDRICK (cont'd) HK7	H 5 hyS alF	Engelmann spruce, alpine fir	Moderate: frost action	Moderate: drainage	Severe to Moderate: drainage, frost action	Moderate (<60%) High (>60%)
HK8	W H 6 - 5 hyS hyS lP			Severe: drainage	Severe: drainage, frost action	
HERRICK PASS HP1, 7	H 6 alF	alpine fir, Engelmann spruce	Severe: frost	Severe to Moderate: rooting depth	Slight to Moderate: frost action	Low
HP3	P 7 H alF				Severe: frost action	
HP5	P P 6 - 7 M H alf alf					
HP8	W 7 H alF eS					
HP11	H 7 P					
HOLLIDAY HL1	H 5 hyS lP	Engelmann spruce, lodgepole pine, alpine fir	Moderate: frost action	Slight	Moderate to Severe: slope, frost action	Moderate (<60%) High (>60%)
HL2	H 5 - 4M M hyS lP					
HL3	H 6 alF eS					
HL4, 7	H 5 - 4S alF hyS hyS			Moderate: drainage		
HL11	E 7			Severe: depth to bedrock	Severe: slope, depth to bedrock	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
HOLTSLANDER HO1, 2, 4, 5, 7	H 5 M hyS lP	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action	Slight	Moderate: frost action	Low
HO3	H 6 alF		Moderate to Severe: frost action		Moderate to Severe: frost action	
HO8	W H 6 - 5 H alF hyS lP		Moderate to Severe: frost action	Slight	Moderate to Severe: frost action	
HOMINKA HA1, 4	W 7	NONE	N.A.	N.A.	Severe: drainage, subgrade, flooding, frost action	Low
HORSESHOE HS1, 2, 4	H 5 hyS lP	Engelmann spruce alpine fir, lodgepole pine	Moderate: frost action	Slight	Moderate to Severe: slope, frost action	Moderate (<60%) to High (>60%)
HS3	H 6 alF eS					
HS5	H H 5 - 6 hyS R lP alF lP		Moderate to Severe: frost action	Moderate: depth to bedrock	Moderate to Severe: slope, frost action, depth to bedrock	
HS6	H 6 R alF lP			Severe: depth to bedrock	Severe: depth to bedrock, slope, (frost action)	
HS7	H 5 hyS lP			Moderate: drainage, rooting depth	Moderate to Severe: slope, frost action, drainage	
HS11	E 7 R				Severe: frost, slope, drainage	
KNUDSEN CREEK KN1	I 5 eS	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action	Moderate: rooting depth	Severe: flooding, (frost action)	Low
KN2	I M 5 - 4 eS lP				Moderate: flooding, frost action	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
KNUDSEN CREEK (cont'd) KN7	I 5 eS	Engelmann spruce, alpine fir, lodgepole pine	Moderate to Severe: frost action, brush comp.	Moderate: rooting depth, drainage	Severe: flooding, (frost action), (drainage)	Low
KN8	I W 5 - 7 H eS bS			Moderate to Severe: rooting depth, drainage	Severe: flooding, drainage, (frost action)	
LANEZI LZ1, 4, 5	H 3S - 4 E D wS wS	white spruce, alpine fir, western hemlock, western red cedar	Moderate: frost action	Moderate: texture	Slight to Moderate: frost action	Moderate (9-30%) High (>30%)
LZ2	H 4 - 3S M dF wS					
LZ7	3S wS		Moderate to Severe: frost action	Moderate to Severe: texture, drainage	Moderate: drainage, frost action	
LZ8	4S - 7W wS		Severe: frost action, brush competition	Severe: texture, drainage	Severe: drainage, subgrade frost action	
LONGWORTH LO1, 2	2S - 3M wS wS	white spruce, alpine fir, western red cedar, black cottonwood	Moderate to Severe: frost action	Slight to Moderate: texture	Moderate to Severe: frost action	Low
LO4	2S wS			Moderate: texture, drainage	Severe to Moderate: frost action, drainage	
LO7, 8	I Ib - 2 bCo wS			Severe to Moderate: drainage	Severe: frost action, drainage, subgrade	
McGREGOR MG1	S 2 bCo	white spruce	Severe: brush comp.	Moderate: drainage, rooting depth	Severe: flooding, drainage	Low
MG8	S W 2 - 7 bCo			Moderate to Severe: drainage, rooting depth		
MENAGIN MN1, 2, 3, 4	R 7 P	NONE	N.A.	N.A.	Severe: frost action, slope	Moderate (<30%) High (>30%)

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
MERRICK MC1	H 5 eS alF	Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate to Severe: (slope), frost action	Moderate (<60%) to High (>69%)
MC3	H 6 alF					
MC6	H 6 R eS alF			Severe: depth to bedrock	Severe: (slope), depth to bedrock, frost action	
MC11	E 7 R		Severe: frost action			
MINNES MI1, 7	H 5 eS alF	alpine fir, Engelmann spruce	Moderate: frost action	Slight	Moderate to Severe: slope, frost action, subgrade	Moderate (9–30%) to High (>30%)
MI2	E H 7 - 5 alF eS		Moderate: frost action		Moderate to Severe: slope, frost action, subgrade	
MI3	H 6 alF		Severe: frost action		Severe to Moderate: frost action, slope	
MI5, 6	H H 6 - 5 R lP alF alF		Moderate: frost action		Severe: depth to bedrock, slope, frost action, subgrade	
MI10, 11	E 7 R		Severe: frost action			
MORKILL ML1	4S - 7E hyS	Engelmann spruce, alpine fir	Moderate to Severe: frost action	Slight	Severe: slope, subgrade, frost action	High (>9%)
MOXLEY MX1	W 7 bS	black spruce	Severe: drainage, brush competition, frost action	Severe: drainage, rooting depth	Severe: drainage, flooding, subgrade	Low
MYHON MH1		NONE	N.A.	Slight	Moderate to Severe: (slope), (subgrade)	Moderate (<60%) to High (>60%)
MH4	M E 5 - 7 eS lP			N.A.	Severe: avalanche, slope	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
MYHON (cont'd) MH7		NONE	N/A	Slight to Moderate: drainage	Moderate to Severe: (slope), (drainage), (avalanche)	Moderate (9-30%) to High (>60%)
NEKIK MOUNTAIN NK1, 4, 5	H 4 M eS lp	lodgepole pine, Engelmann spruce alpine fir,	Moderate: frost action	Moderate: texture	Slight to Moderate: frost action	Moderate (9-30%) to High (>30%)
NK7	H 4 eS lP		Moderate to Severe: frost action	Moderate: texture, drainage	Moderate: frost action, drainage	
NK8	5W - 4H eS eS lP		Severe: frost action, brush competition	Severe: drainage, texture	Severe: subgrade, frost action, drainage	
ONION CREEK ON3	H 5 D eS alF	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action	Moderate: rooting depth	Moderate: frost action, slope	Low (<9%) to Moderate (>9%)
ON5				Moderate: depth to bedrock rooting depth		
OVINGTON CREEK OV1, 4, 7	H 5 hyS lP	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action, brush competition	Slight	Moderate: frost action	Low
OV5, 6	H H 5 - 6 R hyS lP lP alF			Slight to Severe rooting depth	Moderate to Severe: frost action, depth to bedrock	
OV8	H W 5 - 7 hyS bS lP		Severe: frost action, brush competition	Severe: drainage	Severe: frost action, drainage	
PAKSUMD PK1, 4	H H 5 - 6 M eS eS alF lP	Engelmann spruce, alpine fir	Moderate to Severe: frost action	Severe to Moderate: rooting depth	Slight to Moderate: frost action, slope	Moderate (9-30%) to High (>30%)
PK3	H 6 alF	Engelmann spruce, alpine fir	Severe: frost action	Severe: rooting depth	Slight to Moderate: frost action, slope	Moderate (9-30%) to High (>30%)
PK5, 6	H 6 R eS alF		Moderate: frost action		Moderate to Severe: depth to bedrock, slope, frost action	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
PALSSON PL1, 3	C 7 R	NONE	N.A.	N.A.	Severe: frost action, slope	Moderate (<30%) to High (>30%)
PL6					Severe: frost action, depth to bedrock, (slope)	
PAPOOSE PO1	W 7	NONE	N.A.	N.A.	Severe: flooding, subgrade	Low
PAXTON MOUNTAIN PX1, 3	C 7 alF	alpine fir, Engelmann spruce	Severe: frost action	Slight	Severe: frost action, slope	Moderate (<30%) to High (>30%)
PX10, 11		NONE	N.A.	N.A.	Severe: frost action	
PTARMIGAN PM1, 4, 11	M 3S - 4 H wS wS H H lP	white spruce, western red cedar western hemlock	Slight	Slight	Slight	Low
PM7, 8	3M - 2S wS wS lP		Moderate: frost action	Moderate to Severe: drainage	Moderate to Severe: drainage, frost action	
RAMSEY RM7	M S 4 - 3 wS wS	white spruce, alpine fir, lodgepole pine	Slight	Slight to Moderate: drainage	Sight to Moderate: drainage	Low
RAUSH RH1, 3, 4	3S wS	white spruce, alpine fir, western hemlock	Severe to Moderate: frost action, brush competition	Moderate to Severe: rooting depth, texture	Severe: drainage, subgrade, frost action	Moderate (<5%) to High (>5%)
RH7	H 3 - 2S D wS wS			Severe: drainage, rooting depth, texture		
RH8	3S - 7W wS		Severe: frost action, brush competition			
REESOR RR1, 2, 3	C 7 R alF	alpine fir, Engelmann spruce	Severe: frost action	Slight	Severe: frost action, slope	Moderate (<30%) to Severe (>30%)
RR11				Slight to Moderate: depth to bedrock	Severe: frost action, depth to bedrock, slope	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
RENSHAW RN1, 7	3S - 1 hyS bCo	Engelmann spruce	Slight to Moderate: frost action	Moderate: drainage	Severe: flooding, frost action	Low
ROBB RB5	H H 5 - 6 R hyS alF lP lP	Engelmann spruce, alpine fir, lodgepole pine	Moderate: frost action	Slight to Moderate: depth to bedrock	Moderate: frost action, depth to bedrock (slope)	Low (<9%) to Moderate (>9%)
SHEBA MOUNTAIN SB1, 4, 6	C 7 R alF	alpine fir, Engelmann spruce	Severe: frost action	Severe: depth to bedrock	Severe: frost action, depth to bedrock (slope)	Moderate (<30%) to High (>30%)
SUNBEAM SM1, 4	4S - 5H eS eS alF to H 6 - 5H R alF eS eS alF	Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate: slope, subgrade	Moderate (9-39%) to High (>30%)
SM2	4M D wS					
SM3	H H 5 - 6 R eS alF alF eS				Moderate to Severe: slope, frost action, subgrade	
SM7, 8	3S - 5W eS eS		Moderate to Severe: frost action, brush competition	Moderate to Severe: drainage, texture		
SM11	H 7 R	NONE	N.A.	N.A.	Severe: frost action, slope	
TEARE MOUNTAIN TE1, 2	C 7 R	NONE	N.A.	N.A.	Severe: frost action, slope	Moderate (9-30%) to High (>30%)
TE4	H 7 R alF	alpine fir	Severe; frost action	Severe: depth to bedrock		
THUNDER MOUNTAIN TH5	H H 5 - 6 R hyS alF lP lP	lodgepole pine, Engelmann spruce, alpine fir	Moderate: frost action	Slight to Moderate: depth to bedrock	Moderate: subgrade, frost action, depth to bedrock	Low (<9%) to Moderate (>9%)

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
THUNDER MOUNTAIN (cont'd) TH6	H M 6 - 5 R alF hyS lP	lodgepole pine, Engelmann spruce, alpine fir	Moderate: frost action	Moderate to Severe: depth to bedrock	Moderate to Severe: depth to bedrock, subgrade, frost action	Low (<9%) to Moderate (>9%)
TH7	M 5 hyS lP			Moderate: drainage	Moderate: subgrade, frost action, drainage	
TLOOKI OO1, 6	P 7 R	NONE	N.A.	N.A.	Severe: slope, subgrade	Moderate (30-60%) to High (>60%)
TONEKO TO1, 2	2S - 3M D wS wS D	white spruce, western hemlock, alpine fir	Slight	Slight	Slight to Moderate: slope, subgrade	Moderate (30-60%) High (>60%)
TO4, 7	3S wS		Slight to Moderate: frost action, brush competition	Moderate: drainage	Moderate: drainage, subgrade	
TORRENS TR1	E 6 M lP alF	alpine fir, white spruce, lodgepole pine	Moderate: frost action, erosion	Moderate: texture	Moderate to Severe: slope, frost action	High (>60%)
TR5, 6	H E 6 - 7 M R alF alF lP			Severe to Moderate: depth to bedrock	Severe: slope, depth to bedrock, frost action	
TSAHUNGA TS1	C 7 R	NONE	N.A.	N.A.	Severe: frost action, (slope) depth to bedrock	Moderate (<30%) to High (>30%)
TS4				N.A.	Severe: frost action, (slope)	
TURNING MOUNTAIN TM1, 2, 4	H 5 hyS lP	Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate: frost action, (slope)	Low (<9%) to Moderate (>9%)
TM3	H 6 alF					
TM5	H 5 hyS lP			Slight to Moderate: depth to bedrock	Moderate: frost action, depth to bedrock (slope)	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

Table D.4 Soil Interpretations for Forestry (Continued)

SOIL ASSOCIATION COMPONENT	FOREST[1] CAPABILITY	DOMINANT CONIFEROUS TREES	LIMITATIONS FOR REGENERATION	WINDTHROW HAZARD	LIMITATIONS FOR LOGGING ROADS	EROSION HAZARD (% SLOPE)
TURNING MOUNTAIN (cont'd) TM7	H H 5 - 4 hyS eS lP	Engelmann spruce, alpine fir	Moderate: frost action	Slight to Moderate: drainage	Moderate: frost action, drainage, slope	Low (<9%) to Moderate (>9%)
WENDLE WD1	H 4 R wS alF	white spruce, alpine fir	Moderate: frost action	Moderate: depth to bedrock	Moderate to Severe: depth to bedrock, slope, frost action	Moderate (30–60%) to High (>60%)
WD2	M 4 R D wS					
WD5	M 4 - 3S R wS wS					
WD7	H 3S - 4 R wS wS			Moderate: drainage, depth to bedrock	Moderate to Severe: drainage, depth to bedrock, slope, frost action	
WD11	E 7	NONE	N.A. (avalanching)	N.A.	Severe: slope, frost action, avalanching	
WENDT MOUNTAIN WT1, 2, 3, 4	H 5 hyS alF	lodgepole pine, Engelmann spruce, alpine fir	Moderate: frost action	Slight	Moderate to Severe: (slope), frost action	Moderate (<60%) to High (>60%)
WT5	H H 5 - 6 R hyS alF alF			Slight to Moderate: depth to bedrock	Moderate to Severe: (slope) frost action, depth to bedrock	
WT6	H H 6 - 5 R alF hyS alF			Moderate to Severe: depth to bedrock	Severe: depth to bedrock, slope, (frost action)	

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[1] Refer to Kowall (1971) and McCormack (1972) for terminology and methods.

APPENDIX E

METHODOLOGIES AND SOIL INTERPRETATIONS FOR RECREATION

APPENDIX E

METHODOLOGIES CONCERNING SOIL INTERPRETATIONS FOR RECREATION

INTRODUCTION

The following soil interpretations for recreational carrying capacity are based upon soil and associated landscape properties (Table E.4). Each soil association and usually each association component consists of a unique set of properties which may limit recreational use. The soil properties selected for the carrying capacity ratings are texture, coarse fragments, depth to impervious layer, depth to bedrock, drainage and surface organic accumulation. Associated landscape properties include slope, bedrock exposures, gullying, falling, avalanching, flooding, piping, karst, and periglacial processes.

The interpretations are meant to be used with 1:50 000 scale soil maps and are useful for recreation planning and management. However, specific sites must be investigated before operational decisions are made. There are some limitations to this carrying capacity rating system: there is a lack of field checks necessary to positively identify all soil and landscape properties within each map polygon (a majority of the mapping was done by airphoto interpretation supported by selective field observations); and the complexity of soil properties such as drainage within each polygon are often identified but, due to the scale of mapping, their location and extent is impossible to delineate.

It must be stressed that the limitations and carrying capacity ratings herein are determined mainly on soil properties. In order to determine a complete recreational carrying capacity of a given area other factors such as hydrology, vegetation, wildlife and climate have to be evaluated. Recreational features[1] which may attract use are also not considered in these interpretations.

Several of the engineering interpretations found in Appendix C (such as those for septic tanks) influence soil suitabilities for intensive forms of recreational use and should be consulted.

METHODS

Interpretive methods of determining soil limitations for campgrounds and picnic sites, as well as trails and paths, were adapted from Montgomery and Edminister (1966). Coen and Holland (1976), Vold (1975), and Brocke (1970) discuss how soil characteristics affect recreational use. Tables E.1 and E.2 illustrate ratings for significant soil characteristics in terms of their limitations for use: slight, moderate or severe.

Interpretations used to assess recreational carrying capacity were adapted from Block and Hignett (1976) and reflect information available from the biophysical soil resource inventory; they are presented in Table E.3. Block and Hignett provide a discussion of how soil characteristics affect physical carrying capacity and explain the nature of carrying capacity classes. Basically, Class 1 soils have the highest physical carrying capacity and thus are suitable for intensive recreational use. Class 2 soils have few soil limitations. Class 3 soils have soil limitations which restrict most forms of intensive recreational activity (e.g. developed camp-

[1] A recreational features program was undertaken in the study area in 1976; 1:50 000 scale feature maps are available as well as a report by Block (1977). The recreation sector also intends to produce recreation carrying capacity maps which take into consideration soil, vegetation, wildlife, and hydrologic limitations for use.

grounds). Class 4 soils have major soil limitations which restrict both intensive and extensive recreational use. Class 5 areas have the lowest carrying capacity with severe limitations affecting most forms of use (i.e. steep rock faces which can only be used for rock climbing).

Table E.1
Soil Limitations for Campgrounds and Picnic Sites*

SOIL PROPERTY AFFECTING USE	DEGREE OF SOIL LIMITATION		
	SLIGHT	MODERATE	SEVERE
Drainage Class[1] (Wet)[2]	Well to Moderately Well Drained	Imperfectly Drained	Poorly to Very Poorly Drained
Flooding (Flood)	None	None during season of use	Floods during season of use
Slope	0-9% (A-D)	9-15% (E)	>15% (F to H)
Texture[1]	SL, FSL, VFSL, L	SIL, CL, SCL, LS, SICL, sand other than loose sand	SC, SIC, C, loose sand subject to severe blowing, organic
Coarse fragments (CF)	0-50%	50-75%	>75%
Rockiness[3] (Rock)	Rock exposures cover less than 5% of area	Rock exposures cover from 5 to 20% of area	Rock exposures cover more than 20% of area
Depth to Bedrock (Depth)	>1 m	0.5-1.0 m	<0.5 m

Table E.2
Soil Limitations for Trails and Paths*

SOIL PROPERTY AFFECTING USE	DEGREE OF SOIL LIMITATION		
	SLIGHT	MODERATE	SEVERE
Drainage Class[1] (Wet)[2]	Well to Moderately Well Drained	Imperfectly Drained	Poorly and Very Poorly Drained
Flooding (Flood)	None	Light Floods can occur every 3-4 years	Floods more frequently than every 3-4 years
Slope	0-15% (A-E)	15-60% (E-G)	60% + (H)
Texture[1]	SL, FSL, VFSL, L	SIL, CL, SCL, SICL, LS	SC, SIC, C, S, organic
Coarse Fragments (CF)	0-50%	50-75%	75% +
Rockiness[3] (Rock)	Rock exposures cover <20% of area	Rock exposures cover from 20-50% of area	Rock exposures cover >50% of area
Depth to Bedrock (Depth)	>50 cm	10-50 cm	-

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* These tables adapted from Montgomery and Edminister (1966).

[1] See "The System of Soil Classification for Canada", Canada Dept. Agriculture (1974) for definitions.

[2] The abbreviations in brackets are used in Table 4.10 to indicate limitations.

[3] Each mapping unit must be considered separately to determine the amount of rock in the unit, therefore, rockiness is not considered in the soil ratings.

Table E.3
Limitations Classes for Recreational Carrying Capacity*

SOIL PROPERTY AFFECTING USE	DEGREE OF SOIL LIMITATION		
	NONE TO SLIGHT	MODERATE	SEVERE
Texture[1] - fine	S^{f1}: L	S^{f2}: CL, SICL, SCL, SIL plus gravelly classes	S^{f3}: SC, SIC, C plus gravelly classes
- coarse	S^{c1}: gL, SL, gSL	S^{c2}: LS, gLS, vgLS, vgL, vgSL	S^{c3}: S, gS, vgS, gravels
Coarse Materials (>3" diameter)	S^{b1}: <25%	S^{b2}: 25-50%	S^{b3}: >50%
Bedrock/Rockiness[3] (includes up to 10 cm unconsolidated material)	S^{r1}: Rock exposures <25% of area	S^{r2}: Rock exposures 25-50% of area	S^{r3}: Rock exposures >50% of area
Depth to Impervious Layer	S^{s1}: >1 m	S^{s1}: 0.5-1.0 m	S^{s3}: 0.1-0.5 m
Depth to Bedrock	S^{k1}: >1 m	S^{k2}: 0.5-1.0 m	S^{k3}: 0.1-0.5 m
Drainage - Wet	S^{w1}: Moderately well drained	S^{w2}: Imperfectly drained	S^{w3}: Poorly and very poorly drained
- Dry	S^{m1}: Well drained	S^{m2}: Rapidly drained	
Surface Organic Accumulation	S^{o1}: <15 cm of organic matter	S^{o2}: 15-40 cm of organic matter	S^{o3}: >40 cm of organic matter
Flooding	H^{l1}: no flooding hazard; stream can be used all season	H^{l2}: some flooding may take place during high rainfall event or snowmelt period	H^{l3}: flooding may occur in response to limited rainstorms of overnight duration; area not accessible during spring melt or high rain periods

Slope	T^{s1}: 0-2%	T^{s2}: 3-15%	T^{s3}: 16-30%	T^{s4}: 31-60%	T^{s5}: >60%

Other Limitations:

S^{u}: unspecified soils or landform factor; slight to severe (i.e. soil chemical property). Further description required.

L^{g}: gullying; moderate to severe.

L^{a}: avalanching; severe.

L^{p}: periglacial processes; moderate to severe.

L^{u}: unspecified landform modifying process; slight to severe (i.e. piping, karst). Further description required.

* This table is adapted from Block and Hignett (1976).

[1] See "The System of Soil Classification for Canada", Canada Dept. Agriculture (1974) for definitions on texture symbols.

[2] The symbols for limitation classes (e.g. S??) are used in Table 4.10.

[3] Each mapping unit must be considered separately to determine the amount of rock in the unit, therefore, rockiness is not considered in the soil ratings.

LEGEND FOR TABLE E.4, RECREATION CARRYING CAPACITY RATINGS*

Physical Carrying Capacity Classes

Class 1 - Very high
Class 2 - High
Class 3 - Moderate
Class 4 - Low
Class 5 - Very low

Physical Limitations

S - Soil limitations
    b - stoniness
    c - coarse textures
    f - fine textures
    k - shallow to bedrock
    m - rapid drainage
    o - organic matter
    r - rockiness
    s - impervious soil horizon
    w - imperfect to poor drainage

Hl - Flooding hazard limitations
Ts - Topographic (slope steepness) limitations
La - Avalanching limitations
Lp - Periglacial limitations (e.g. severe frost churning)

Example

		Limitation
Carrying capacity class	Sf2 ^{3}Ts3	Severity of limitation

* adapted from Block and Hignett (1976); see Table E.3, p. 47.

Table E.4
Soil Interpretations for Recreation

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Abbl Mtn. AB 7	Moderate: Wet	Moderate: Wet	Sw2 Ts2
Babette BB 1,3,4	Severe: Slope	Moderate: Slope	Ts4 Sc2
BB 5,6	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts4 - Ts5 Sk2-3 Sk2-3
BB 7	Severe to Moderate: Slope, wet	Moderate to Severe: Slope, wet	Ts4 - Ts5 Sw2 Sw2
Becker Mtn. BC 1	Severe: Slope, CF	Moderate to Severe: Slope, CF	Sb3 - Ts5 Ts3-4 Sp3
BC 5,6	Severe: Slope, depth, avalanche	Severe: Slope, avalanche	Ts5 La Sk3
Bastille BS 1,3	Slight to Severe: Slope	Slight to Moderate: Slope	Ts2 - Ts3-4 Ss2 Ss3
BS 5,6	Moderate to Severe: Slope, depth	Slight to Moderate: Slope, depth	Sk2-3 Ts2-3 Ss2
BS 7	Moderate: Wet, slope	Moderate: Wet	Ts2-3 Sw2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Barton			
BT 1	Severe: Slope	Moderate to Severe: Slope	Ts4 - Ts5 Sf2
BT 5	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts4 Ts5 Sk2 - Sk2-3 Sf2
BT 7	Severe to Moderate: Slope, wet	Moderate to Severe: Slope, wet	Ts3 - Ts4 Sw2 Sw2
Blue Lake			
BE 3	Severe: Slope, text	Moderate to Severe: Slope, text	Ts3 Ts5 Sf2 - Sf2 Ss2 Ss2
BE 5	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts3 Ts4 Sk2 - Sk2 Sf2 Sf2
BE 7	Severe: Slope, wet	Moderate to Severe: Slope, wet	Ts3 Ts4 Sw2 - Sw2 Sf2 Sf2
Beauregard Mtn.			
BG 1,3	Moderate to Severe: Slope, text	Slight to Moderate: Slope, text	Ts2 - Ts3
BG 5,6	Moderate to Severe: Slope, depth, text	Slight to Moderate: Slope, depth, text	Ts2-3 Sk2-3 Sf2
BG 7	Moderate to Severe: Slope, wet, text	Moderate: Wet, slope, text	Sw2 Ts2-3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Bowron			
BO 1	Severe to Moderate: Text, slope	Moderate to Severe: Text, slope	Sf2 - Sf3 Ts2 Ts2
BO 5	Severe to Moderate: Text, slope, depth	Moderate to Severe: Text, slope, depth	Sf2 Sf3 Ts2 - Ts3 Sk2 Sk2
BO 7,8	Severe: Text, wet, slope	Severe to Moderate: Text, wet, slope	Sf3 Sf3 Sw3 - Sw2 Ts2 Ts2
BO 11	Severe: Text, slope, wet	Severe: Text, slope, wet	Sf3 Sw3 Ts4
Bowes Creek			
BW 1,4	Severe to Moderate: Text, slope, wet	Moderate to Severe: Text, slope	Sf3 Sf3-2 Ts2 - Ts2 Ss3
BW 7,8	Severe: Text, wet	Severe: Text, wet	Sf3 Ss3 Sw3
BW 11	Severe: Text, wet, slope	Severe: Text, wet, slope	Sf3 Ss3 Ts3
Catfish Creek			
CC 1,4,5,6	Severe: Wet, text	Severe: Wet, text	Sw3 So3
Chief			
CF 1,4	Severe: Wet, text	Severe: Wet, text	Sw3 So3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Cushing			
CS 1,6	Severe: Avalanche, slope, depth	Severe: Depth, rock	La Ts4 Sk3
CS 4,7	Severe: Avalanche, wet	Severe to Moderate: Avalanche, wet	La - La Sw3 Sw2
Dudzic			
DC 1,2	Moderate to Severe: Text	Moderate: Text	Sf2 - Sf3 Ts2 Ts2
DC 7	Severe to Moderate: Text, wet	Moderate to Severe: Text, wet	Sf3 - Sf2 Ts2 Sw2
Dominion			
DO 1,3	Slight to Severe: Slope	Slight to Moderate: Slope	Ts2 - Ts3
DO 5	Moderate to Severe: Slope, depth	Slight to Moderate: Slope, depth	Ts2-3 Sk2
DO 7,8	Moderate to Severe: Slope, wet	Moderate: Wet	Sw2 Ts2-3
Dezalko			
DZ 1,3	Severe: Slope	Moderate to Severe: Slope	Ts4 - Ts5
DZ 5,6	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts4 Ts5 Sk2-3 - Sk2-3
DZ 7	Severe: Slope, wet	Moderate to Severe: Slope, wet	Ts4 - Ts5 Sw2 Sw2
DZ 11	Severe: Avalanche, slope, wet	Severe: Avalanche, slope, wet	La Ts5-4 Sw2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Five Cabin Creek			
FC 1,3,4	Slight	Slight	Ts2
FC 5	Moderate: Depth	Slight to Moderate: Depth	Sk2 Ts1-2
FC 7,8	Moderate: Wet	Moderate: Wet	Sw2
Forgetmenot			
FG 1,4	Slight	Slight	Ts2 Tf2
FG 7,8	Moderate: Wet	Moderate: Wet	Sw2
Fontoniko			
FN 1	Moderate to Severe: Flood, CF, slope	Moderate: Flood, CF	Hi2-3 Hi3 Sb2-3 - Sb2-3 Ts3 Ts4
FN 7	Severe: Flood, wet, piping	Moderate to Severe: Flood, wet, piping	Lu Lu Hi3 - Hi2 Sw2 Sw2
Framstead			
FR 1,3	Severe: Failures, gulling, slope	Severe: Failures, gulling, slope	Lf Lg Ts4
FR 4	Severe: Avalanche, wet, text	Severe: Avalanche, wet, text	La Sw2 Sf3
Footprint			
FT 7	Moderate: Wet, slope	Moderate: Wet	Sw2 Ss2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Guilford GF 1,2,7,8	Severe: Wet, flood	Severe: Wet, flood	Hl Sw2
Gable Mountain GM 1,3,4	Severe: Slope, frost, depth	Severe: Slope, frost, depth	Lp Sk3 Ts3-5
Hominka HA 1,4	Severe: Wet, text	Severe: Wet, text	Sw3 So3
Hambrook HB 1	Moderate to Severe: Slope, text	Slight to Moderate: Slope, text	Sf2 Ts2-3 Ss2
HB 4	Slight to Severe: Slope	Slight to Moderate: Slope	Ts2 - Ts3 Ss2 Ss2
HB 5	Moderate to Severe: Slope, depth, text	Slight to Moderate: Slope, depth, text	Sf2 Sk2 Ts2-3
HB 7,8	Moderate Severe: Slope, wet, text	Moderate: Wet, text	Sw2 Sf2
Hedrick HK1,3,4	Severe: Slope	Moderate to Severe: Slope	Ts3 - Ts5
HK 5,6	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts3 - Ts5 Sk2-3 Sk2-3
HK 7	Severe: Slope, wet	Moderate to Severe: Slope, wet	Ts3 - Ts4 Sw3 Sw2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Holliday			
HL 1,2,3,4	Severe: Slope	Moderate: Slope	Ts3 - Ts5
HL 5,6	Severe: Slope, depth	Moderate: Slope, depth	Ts3 - Ts5 Sk3 Sk3
HL 7	Severe: Slope, wet	Moderate: Slope, wet	Ts3 - Ts3 Sw2 Sw2
HL 11	Severe: Avalanche, CF, slope	Severe: Avalanche, wet, depth	La Sb2 Sk3
Holtslander			
HO 1,2,3,4	Slight	Slight	Sf2 Ts2
HO 5	Slight to Moderate: Depth	Slight	Sk2
HO 7,8	Moderate to Severe: Wet	Moderate to Severe: Wet	Sw3-2
Herrick Pass			
HP 1	Slight	Slight	Ts2
HP 3	Moderate to Severe: Frost, CF, slope	Moderate: Frost, CF, text	Lp Lp Sb2 - Sb3 Ts2 Sc3
HP 5	Severe to Moderate: Text, CF	Moderate: Text, CF	Sb2 - Sb3 Sc2 Sc3
HP 7,8	Severe to Moderate: Wet, text	Moderate: Wet, text	Sw2 - Sw3 So2 So3
HP 11	Severe: Text, CF, slope	Severe to Moderate: Text, CF, wet	Sc3 Sc2 Sb3 - Sb2 Ts3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Horseshoe			
HS 1,2,3,4	Severe: Slope	Moderate to Severe: Slope	Ts3 - Ts5
HS 5,6	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts3 - Ts5 Sk2-3 Sk2-3
HS 7	Severe: Slope, wet	Moderate: Slope, wet	Ts3 - Ts4 Sw2 Sw2
HS 11	Severe: Avalanche, slope	Severe: Avalanche, gullying	La Lg TS4
Knudsen Creek			
KN 1	Severe: Flood	Severe: Flood	HI3
KN 2	Moderate: Flood	Moderate: Flood	HI2
KN 7,8	Severe: Flood, wet	Severe: Flood, wet	HI3 Sw2
Longworth			
LO 1,2	Moderate: Text, wet	Slight	Sf2 - Sf2-3 Sw2 Sw2-3
LO 4,7,8	Moderate to Severe: Wet, text	Moderate: Wet, text	Sw2 - Sw3 Sf2 Sf3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Lanezi			
LZ 1,2,4	Moderate to Severe: Text, depth, slope	Moderate Text, depth	Sf2-3 Ss2 Ts2-3
LZ 5	Moderate to Severe: Slope, depth, text	Slight to Moderate: Text, slope	Ts2-3 Sk2 Sf2
LZ 7,8	Severe to Moderate: Wet, text, slope	Moderate: Wet, text	Sw3 Sw3 Sf2 - Sf3 Ts2 Ts3
Merrick			
MC 1,3	Severe: Slope	Moderate to Severe: Slope	Ts3 - Ts5
MC 6	Severe: Slope, depth	Moderate to Severe: Slope	Ts3 - Ts5 Sk2 Sk3
MC 11	Severe: Avalanching, depth, slope	Severe: Avalanching	La Ts5 Sk3
McGregor			
MG 1,8	Severe: Wet, flood	Severe: Wet, flood	Hl Sw2
Myhon			
MH 1	Severe: Slope	Moderate to Severe: Slope	Ts3 - Ts5 Su2 Su2
MH 4	Severe: Slope, avalanche	Severe: Slope, avalanche	La Ts3-5 Su2
MH 7	Severe: Slope, wet	Moderate to Severe: Slope, wet	Ts3 Ts4 Sw2 - Sw2 Su2 Su2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Minnes			
MI 1,3	Severe: Slope, text	Moderate to Slight: Slope, text	Ts2 - Ts3 Sf2 Sf2
MI 2	Severe: Slope, gullying	Moderate to Severe: Gullying, slope	Lq - Ts2 Ts3-4
MI 5,6	Severe: Slope, depth	Moderate to Severe: Gullying, slope	Lq - Ts2 Ts3-4
MI 7	Severe: Slope, wet	Moderate: Text, wet, slope	Ts3 Sf2 Sw2 - Ts3 Sw2
MI 10	Severe: Gullying, slope	Severe: Gullying, falling	Lq Lq Lf - Lf Ts3 Ts4
Morkill			
ML 1	Severe: Gullying, slope	Severe: Gullying, slope	Lg Ts4
Menagin			
MN 1,2,3,4	Severe: Frost, slope, rock	Severe: Frost, rock	Lp Sb2-3
Moxley			
MX 1	Severe: Text, wet	Severe: Text, wet	So3 Sw3
Nekik Mountain			
NK 1,4	Moderate: Slope, text	Moderate: Text	Ts2 Sf2
NK 5	Moderate to Severe: Slope, depth, text	Moderate: Text	Ts2 Ts3 Sk2 - Sf2 Sf2
NK 7,8	Severe to Moderate: Text, wet	Moderate to Severe: Wet, text	Sf2 - Sw3 Sw3-2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Onion Creek			
ON 3	Slight to Severe: Slope, text	Slight to Moderate: Slope, text	Ts2 - Ts3 Ss2 Ss2
ON 5	Moderate to Severe: Slope, depth	Slight to Moderate: Slope, depth	Sk2 Ts2-3 Ss2
Tlooki			
OO 1	Severe: Slope, CF	Severe to Moderate: Slope, CF	Ts4 - Ts5 Sb3 Sp3
OO 6	Severe: Avalanching, slope	Severe: Avalanching, slope	Ts5 La Sk3
Ovington Creek			
OV 1,2,3,4	Slight to Moderate: CF	Slight to Moderate: CF	Sc2 Ts1-2
OV 5,6	Moderate: Depth, CF	Slight to Moderate: Depth, CF	Sb2 - Sb2 Sk2 Sk3
OV 7,8	Moderate: Wet	Moderate: Wet	Sw2
Paksumo			
PK 1,3,4	Slight to Severe: Slope, text	Slight to Moderate: Slope, text	Ts2 - Ts3 Sf2 Sf2
PK 5,6	Moderate to Severe: Slope, depth, text	Slight to Moderate: Slope, depth	Sk2 Ts2-3 Ss2
PK 10	Severe: Slope, CF	Moderate: CF, slope	Ts3 - Ts2 Sb3 Sb2
PK 11	Severe: Frost, slope, CF	Severe: Frost, CF	Lp Ts2-4 Sb2-3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Palsson			
PL 1,3	Severe: Slope, frost	Severe: Frost, slope	Lp - Ts5 Ts2-4 Lp
PL 6	Severe: Depth, slope, frost	Severe: Frost, slope, depth	Lp Ts2-5 Sk3
Ptarmigan			
PM 1,4,11	Slight to Moderate: CF	Slight	Sc2 Ts1-2
PM 7,8	Moderate: Wet	Moderate: Wet	Sw2
Papoose			
PO 1	Severe: Text, wet	Severe: Text, wet	So3 Sw3
Paxton Mtn.			
PX 1,3	Moderate to Severe: Slope, frost	Moderate: Slope, frost	Lp Ts2-3
PX 10,11	Severe: Slope, frost, CF	Severe to Moderate: Frost, CF	Lp Lp Ts3 - Sb2-3 Sb3
Robb			
RB 5	Moderate to Severe: Slope, depth	Slight to Moderate: Slope, depth	Sk2-3 Ts2-3
Raush			
RH 1,3,4	Severe: Text, depth	Severe: Text, depth	Sf3 Ss3
RH 7,8	Severe: Text, wet, depth	Severe: Text, wet, depth	Sf3 Sw2-3 Ss3

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Ramsey RM 7	Moderate: Wet, text	Moderate: Wet	Sw2 Sc3
Renshaw RN 1,7	Severe: Flood, wet	Severe: Flood, wet	Hl Sw2-3
Reesor RR 1,2,3	Moderate to Severe: Slope, frost	Moderate to Severe: Slope, frost	Lp Ts5 Ts2-4 - Lp Su2 Su2
RR 11	Moderate to Severe: Slope, depth, frost	Moderate to Severe: Slope, depth, frost	Lp Ts5 Ts2-4 - Lp Sk2 Sk2
Sheba Mtn. SB 1,3,4	Severe: Depth, slope, frost	Moderate to Severe: Slope, depth, frost	Lp Ts5 Sk3 - Lp Ts2-4 Sk3
Sunbeam SM 1,2,3,4	Moderate to Severe: Slope, text	Slight to Moderate: Text	Ts2 - Ts3 Sf2 Sf2
SM 5	Moderate to Severe: Slope, depth, text	Slight to Moderate: Slope, text	Ts2 Ts3 Sk2 - Sk2 Sf2 Sf2
SM 7,8	Moderate to Severe: Slope, wet	Moderate: Wet, text	Ts2 Ts3 Sw2 - Sw2-3 Sf2
SM 11	Severe: Frost, slope	Severe: Frost, text	Lp Sf2

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Teare Mtn. TE 1,2,4	Severe: Frost, slope	Moderate to Severe: Frost	Lp Lp Ts4 -
Thunder Mtn. TH 1	Slight to Severe: Slope	Slight to Moderate: Slope	Ts2 - Ts3 Ss2 Ss2
Turning Mtn. TM 1,2,3,4	Slight to Severe: Slope	Slight to Moderate: Slope	Ts2 - Ts3
TM 5	Moderate to Severe: Slope, depth	Slight to Moderate: Slope, depth	Sk2 Te2-3
TM 7	Moderate: Wet, slope	Moderate: Wet	Sw2 Ts2-3
Toneko TO 1,2,4	Slight to Severe: Slope, falling	Slight to Severe: Text, slope,falling	Ts4-3 Lf Sc3
Torrens TR 1	Severe: Slope, falling	Severe: Text, falling	Lf Sc3 Ts4
TR 5,6	Severe: Slope, falling, depth	Severe: Text, falling	Ts4 Lf Sk2-3
Tsahunga TS 1,4	Severe: Slope, depth, frost	Severe: Slope, depth, frost	Lp Sk3 Ts2-5

Table E.4 Soil Interpretations for Recreation (Continued)

(NOTE: Limitations and Ratings are based upon soil properties only)

SOIL ASSOCIATION COMPONENT	DEGREE AND KIND OF LIMITATION FOR:		RECREATION CARRYING CAPACITY
	CAMPGROUNDS AND PICNIC SITES	TRAILS AND PATHS	
Wendle			
WD 1,2,3,5	Severe: Slope, depth	Moderate: Slope	Ts3 - Ts5
WD 7	Severe: Wet, slope	Moderate: Wet, slope	Ts3 - Ts5 Sw2 Sw2
WD 11	Severe: Avalanching, slope	Severe to Moderate: Avalanching, slope	La - La Ts3 Ts4-5
Wendt Mtn.			
WT 1,3	Severe: Slope	Moderate to Severe: Slope	Ts3 - Ts5
WT 5,6	Severe: Slope, depth	Moderate to Severe: Slope, depth	Ts3 - Ts5 Sk2-3 Sk2-3

APPENDIX F

COMPARISONS OF TWO CANADIAN SYSTEMS OF SOIL CLASSIFICATION; THE 1973 REVISED WITH THE 1978 EDITION

APPENDIX F

COMPARISONS OF TWO CANADIAN SYSTEMS OF SOIL CLASSIFICATION; THE 1973 REVISED WITH THE 1978 EDITION

1973 (revised) Classification		1978 Classification	
Orthic Eutric Brunisol	(O.EB)	[e]Orthic Eutric Brunisol Orthic Dystric Brunisol	(O.EB) (O.DYB)
Degraded Eutric Brunisol	(DG.EB)	[e]Eluviated Eutric Brunisol Eluviated Dystric Brunisol	(E.EB) (E.DYB)
Orthic Melanic Brunisol	(O.MB)	[+e]Orthic Melanic Brunisol Orthic Eutric Brunisol Orthic Sombric Brunisol Orthic Dystric Brunisol	(O.MB) (O.EB) (O.SB) (O.DYB)
Degraded Melanic Brunisol	(DG.MB)	[e+]Eluviated Melanic Brunisol Eluviated Eutric Brunisol Eluviated Sombric Brunisol Eluviated Dystric Brunisol	(E.MB) (E.EB) (E.SB) (E.DYB)
Orthic Dystric Brunisol	(O.DYB)	Orthic Dystric Brunisol	(O.DYB)
Degraded Dystric Brunisol	(DG.DYB)	Eluviated Dystric Brunisol	(E.DYB)
Orthic Sombric Brunisol	(O.SB)	[+]Orthic Sombric Brunisol Orthic Dystric Brunisol	(O.SB) (O.DYB)
Degraded Sombric Brunisol	(DG.SB)	[+]Eluviated Sombric Brunisol Eluviated Dystric Brunisol	(E.SB) (E.DYB)
Orthic Humic Gleysol	(O.HG)	Orthic Humic Gleysol	(O.HG)
Rego Humic Gleysol	(R.HG)	Rego Humic Gleysol	(R.HG)
Orthic Gleysol	(O.G)	Orthic Gleysol	(O.G)
Rego Gleysol	(R.G)	Rego Gleysol	(R.G)
Orthic Luvic Gleysol	(O.LG)	Orthic Luvic Gleysol	(O.LG)
Orthic Gray Luvisol	(O.GL)	Orthic Gray Luvisol	(O.GL)
Dark Gray Luvisol	(D.GL)	Dark Gray Luvisol	(D.GL)

APPENDIX F

COMPARISONS OF TWO CANADIAN SYSTEMS OF SOIL CLASSIFICATION; THE 1973 REVISED WITH THE 1978 EDITION

(CONTINUED)

1973 (revised) Classification (Cont'd)		1978 Classification (Cont'd)	
Brunisolic Gray Luvisol	(BR.GL)	Brunisolic Gray Luvisol	(BR.GL)
Podzolic Gray Luvisol	(P.GL)	*Podzolic Gray Luvisol	(PZ.GL)
Gleyed Orthic Gray Luvisol	(GL.O.GL)	Gleyed Gray Luvisol	(GL.GL)
Gleyed Brunisolic Gray Luvisol	(GL.BR.GL)	Gleyed Brunisolic Gray Luvisol	
Gleyed Podzolic Gray Luvisol	(GL.P.GL)	Gleyed Podzolic Gray Luvisol	(GLPZ.GL)
Orthic Humo-Ferric Podzol	(O.HFP)	*Orthic Humo-Ferric Podzol	(O.HFP)
Gleyed Orthic Humo-Ferric Podzol	(GL.O.HFP)	*Gleyed Humo-Ferric Podzol	(GL.HFP)
Sombric Humo-Ferric Podzol	(SM.HFP)	#*Sombric Humo-Ferric Podzol	(SM.HFP)
Luvisolic Humo-Ferric Podzol	(LU.HFP)	!*Luvisolic Humo-Ferric Podzol	(LU.HFP)
Orthic Ferro-Humic Podzol	(O.FHP)	Orthic Ferro-Humic Podzol	(O.FHP)
Gleyed Orthic Ferro-Humic Podzol	(GL.O.FHP)	*Gleyed Ferro-Humic Podzol	(GL.HFP)
Sombric Ferro-Humic Podzol	(SM.FHP)	#Sombric Ferro-Humic Podzol	(SM.FHP)
Luvisolic Ferro-Humic Podzol	(LU.FHP)	!Luvisolic Ferro-Humic Podzol	(LU.FHP)
Cumulo Fibrisol	(CU.F)	Cumulo Fibrisol	(CU.F)
Sphagno Fibrisol	(SP.F)	Typic Fibrisol	(TY.F)
Terric Fibrisol	(T.F)	Terric Fibrisol	(T.F)
Cumulo Mesisol	(CU.M)	Cumulo Mesisol	(CU.M)
Fibric Mesisol	(FI.M)	Fibric Mesisol	(FI.M)
Terric Mesisol	(T.M)	Terric Mesisol	(T.M)
Typic Mesisol	(TY.M)	Typic Mesisol	(TY.M)

APPENDIX F

COMPARISONS OF TWO CANADIAN SYSTEMS OF SOIL CLASSIFICATION; THE 1973 REVISED WITH THE 1978 EDITION

(CONTINUED)

1973 (revised) Classification (Cont'd)		1978 Classification (Cont'd)	
Orthic Regosol	(O.R)	Orthic Regosol	(O.R)
		Orthic Humic Regosol	(O.HR)
Cumulic Regosol	(CU.R)	Cumulic Regosol	(CU.R)
		Cumulic Humic Regosol	(CU.HR)
Gleyed Orthic Regosol	(GL.O.R)	Gleyed Regosol	(GL.R)
		Gleyed Humic Regosol	(GL.HR)
Gleyed Cumulic Regosol	(GL.CU.R)	Gleyed Cumulic Regosol	(GL.HR)
		Gleyed Cumulic Humic Regosol	(GLCU.HR)

Note: All lithic and turbic subgroups in the 1973 (revised) classification are now lithic and turbic phases in the 1978 classification.

Footnotes:

[@] Eutric and Melanic Brunisols were defined in the 1973 (revised) classification as having within the control section a pH ($CaCl_2$) greater than 5.5. Many of these soils, especially in the higher elevations where acidic topsoils overlie calcareous parent materials, would now be classified as Dystric or Sombric Brunisols.

[+] Melanic and Sombric Brunisols were defined in 1973 (revised) classification as having an Ah of at least 5 cm thickness. Many of these soils would now be Eutric or Dystric Brunisols, as the 1978 classification now requires a 10 cm minimum Ah thickness for Melanic and Sombric Brunisols.

[#] Sombric subgroups in the Podzolic order needed to have 7.5 cm thick Ah horizon in the 1973 (revised) classification, while they now must be 10 cm thick.

[!] Luvisolic Humo-Ferric Podzols had strongly developed Bt horizon below 75 cm in the 1973 (revised) classification, while they now must be below 50 cm in the 1978 classification (e.g. some Podzolic Gray Luvisols in 1973 are now Luvisolic Humo-Ferric Podzols).

[*] Podzolic Bf horizons needed to be only 5 cm thick in the 1973 (revised) classification, while they now must be 10 cm thick. Therefore, some Humo-Ferric Podzols may now make Brunisols (probably Dystric), and some Podzolic Gray Luvisols may now be classified as Brunisolic Gray Luvisols.

APPENDIX G

SOIL NAME CORELATION GUIDE 93I AND 93H

APPENDIX 6

SOIL NAME CORRELATION GUIDE

(93I, BIOPHYSICAL SOIL RESOURCES AND LAND EVALUATION OF THE NORTHEAST COAL STUDY AREA (1977-1978), AND
93H, SOILS OF THE BARKERVILLE AREA)

TERRESTRIAL STUDIES BRANCH (TSB) (93I)					AGRICULTURE CANADA (AG.C) (93H) (93I S/W)						
Symbol	Soil Name	Classification	Parent[1] Material	Forest[2] Zone	Symbol	Soil Name	Classification	Parent[1] Material	Forest[2] Zone	Report Area	Notes
B	Not used in this area				B	Bednesti	BR.GL	sil	SBS	93H S/W	
BO	Bowron	BR.GL	silL	SBwS-alF:b	Bw Bo	Bowron Bowron	BR.GL BR.GL	silL silL	SBS SBS	93H S/W 93H S/W	
BW	Bowes Creek	BR.GL	silL	IwH-wC	BW	Bowes Creek	BR.GL	silL	ICH	93H S/W	
Br	Not used in this area				Br	Bearpaw Ridge	L.HFP	fgCv	ESSF	93H S/W	similar to (TSB) Holliday Soils
Ct Cp	Not used in this area Not used in this area				Ct Cp	Captain Creek Captain Creek	O.HFP O.HFP	fgMbv fgMbv	ESSF/ICH ESSF/ICH	93H S/W 93H S/W 93H N/W	similar to (TSB) Sunbeam or Lanezi soils similar to (TSB) Sunbeam or Lanezi soils
DO	Dominion	P.G.L	gfMbv	SBwS-alF:b	Do	Dominion	LU.HFP	gfMb	SBS/ICH	93I S/W 93H N/W	similar to (TSB) Lanezi soils
DZ	Dezlako	O.HFP	Cbv	SAmS-alF	Dz	Dezlako	L.HFP	rfMv	ESSF	93I S/W 93H N/W	
FN	Fontoniko (creek)	O.HFP	Ft	IwH-wC	Fn	Fontoniko	E.DYB	Ft	SBS/ICH	93I S/W 93H N/W 93H S/W	
Gu	Not used in this area				Gu	Gunniza	O.HFP	gsL	ICH	93H N/W 93I S/W	similar to (TSB) Lanezi 4 soils
GF	Guilford	CU.R	$\overset{A}{\mathrm{slsF}_1}$	IWG-wS	GF	Guilford	CU.R	$\overset{A}{\mathrm{slsF}_1}$	ICH	93H S/W	similar to (AG.C) McGregor soils
HL	Holliday	O.HFP	Cbv	SAmS-alF							similar to (AG.C) Bearpaw Ridge soils
Ha	Not used in this area				Ha	Hah Creek	SM.HFP	M-C	ICH/ESSF	93I S/W	similar to TSB Sunbeam 7 & 8 members, Holliday 7 & 8 members & Lanezi 7 & 8
LZ	Lanezi	P.GL	Mbv	IwH-wC	Lz	Lanezi	LU.HFP	gfMb	ICH	93I S/W 93H S/W	similar to (AG.C) Dominion soils in SBS
Lo	Longworth	P.GL	F_1	IwC-wS	Lo	Longworth	BR.GL	slsF_1t	ICH	93H N/W 93H S/W	
MG	McGregor	GL.O.R	$\overset{A}{\mathrm{slsF}_1}$	SBwS-alF:b	Mg	McGregor	GL.R	$\overset{A}{\mathrm{slsF}_1}$	SBS	93H S/W 93H N/W 93I S/W	
PX	Paxton Mountain	O.HFP	Mr-C	SAmS-alF:b	Px	Paxton	L.HFP	Cbv, Mbv	At	93I S/W	
SM	Sunbeam	O.HFP	Mbv	SAmS-alF	SM	Not used in these areas					similar to (AG.C) Captain Creek in ESSF
Tp	Not used in this area				Tp	Toppy River	O.HFP	Mbv	ICH/SBS	93I S/W	similar to (TSB) Lanezi 7 soils and Sunbeam 7 soils
WD	Wendle	L.OHFP	Cv	IwH-wC	WD	Not used in these areas				93H S/W	similar to (AG.C) Kenneth soils in ICH; Bearpaw Ridge in ICH and minor SBS

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[1] Refer to "Terrain Symbols" Appendix A.

[2] Refer to Table 2.7.

APPENDIX H

METHODS OF LABORATORY ANALYSIS

APPENDIX H

METHODS OF LABORATORY ANALYSIS

SOIL PROFILE DESCRIPTIONS AND LABORATORY ANALYSIS

Fifty-eight of the sixty-three soil associations, described in the Jarvis Creek - Morkill River map area, have detailed soil profile descriptions. Theses descriptions are supported by a variety of chemical and physical analyses. This information is available from the British Columbia Soil Information System, Ministry of Environment, Victoria, British Columbia.

Soil descriptions were according to: Dumanski J., editor. Revised 1978. The Canadian Soil Information System (CanSIS). Manual for Describing Soils in the Field. Land Resource Research Institute, Agriculture Canada, Central Experimental Farm, Ottawa, Ontario (compiled by the Working Group on Soil Survey Data, Canada Soil Survey Committee).

Soil classification was according to: Canada Dept. of Agriculture, 1974. The System of Soil Classification for Canada. Publ. 1455. Ottawa. pp. 255. (Revised 1973 System for taxonomy.)

CHEMICAL AND PHYSICAL ANALYSES

A variety of laboratory analyses have been performed on the soils described in Chapter 2. The analytical methods(s) or appropriate literature reference(s) for each analysis follows.

Chemical Analysis

Soil Reaction (pH): Method 1 (1:1 soil-water ratio), Method 2 (1:5 soil-water ratio) and Method 4 (in 0.01M$CaCl_2$) are described in McKeague, J. A., editor. 1978. Manual on Soil Sampling and Methods of Analysis. 2nd Edition. Prepared by Subcommittee (of Canada Soil Survey Committee) on Methods of Analysis. Canadian Society of Soil Science. pp. 61, 62.

Organic Carbon (%): Analyses are according to Laboratory Equipment Corporation. 1969. Carbon Analysis by Leco Analyzer. Leco Instruction Manual for Induction Furnace and Carbon Analyzer. St. Joseph's, Michigan.

Nitrogen (%): Analyses are described in McKeague, J. A., editor., 1978. They are according to Brenner, J. M., 1965. Total nitrogen In Methods of Soil Analyses Part 2, pp. 1149-1178. Black, C. A., editor, Agnonomy, No. 9. American Society of Agnonomy, Madison, Wisconsin.

Calcium Carbonate Equivalent(%): The analyses are as described in Black, C. A., editor. 1965. Methods of Soil Analysis. Method 91-3.2. American Society of Agnonomy; No. 9. p. 1386.

Cation Exchange Capacity (me/100 gm): The CEC is determined by NH_4 displacement and macro-Kjeldahl distillation as described in McKeague, J. A., editor. 1978. Method 3321; pp. 78-80.

Exchangeable Cations - Ca, Mg, K, Na, (me/100 gm): are done by atomic absorption spectrophotometry as described in McKeague, J. A., editor. 1978. Method 3311; pp. 73-75.

Iron and Aluminum (%): are done by pyrophosphate extraction method found in McKeague, J. A., editor. 1978; p. 104.

Physical Analysis

Particle Size Distribution: Analyses are according to seiving methods described in McKeague, J. A., editor. 1978. p. 26, and Day, J. R. 1965. *Particle fractionation and particle size analyses.* pp. 545-567 in Methods of Soil Analysis, Black, C. A., editor; Agronomy, No. 9, Part 1. American Society of Agronomy. Madison, Wisconsin.

Mechancial Analysis (% sand, silt and clay): Analyses are according to the Pipettee Method in McKeague, J. A., editor. 1978. pp. 6-15.